Telephony.
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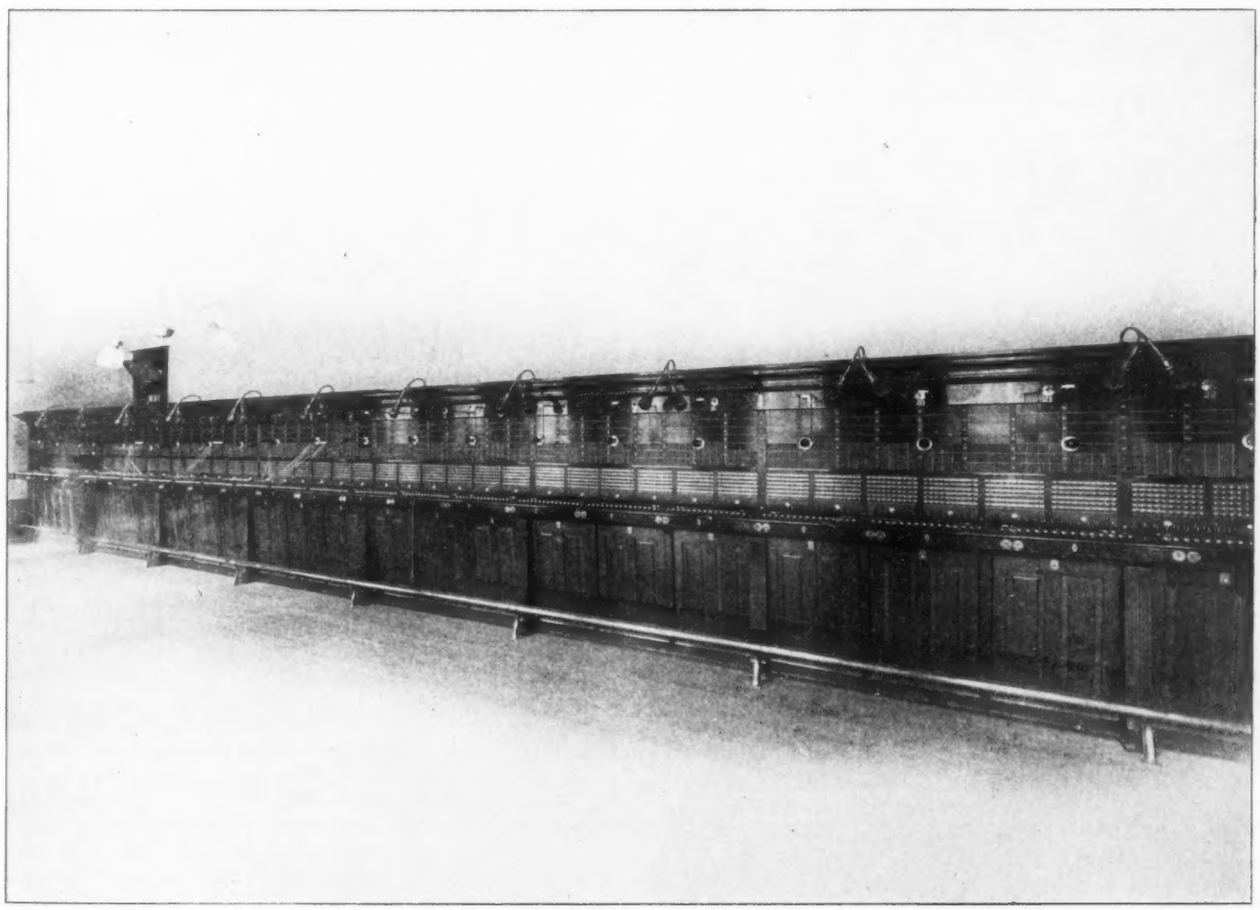
The Fort Wayne Telephone Company's Exchange.

The Fort Wayne Home Telephone Company began operation five or six years ago, installing at that time a magneto transfer trunking switchboard, with something over a thousand subscribers in service. The outside construction work was practically all overhead at that time, and the system was what is known as common return. Provisions made for the future growth of the exchange at Fort Wayne—as in hundreds of other places—were insufficient, and the exchange soon outgrew the estimated number of subscribers, and allowance in pole, line and switchboard capacities, made in anticipation of the future growth of the exchange. In consequence of the rapid increase of subscribers, a vast deal of reconstruction work was carried on, and many appliances added to the exchange equipment from time to time, for the purpose of facilitating the work of operation; but all to no purpose.



MAIN SWITCHBOARD HOME TELEPHONE COMPANY, FT. WAYNE, IND.

Something over a year ago the Home Telephone Company decided to abandon the out-of-date apparatus then in service, and install a modern up-to-date central energy multiple system. It was deemed best at that time to gradually perform the work of reconstructing the exchange plant, and that this work should follow the installation of the new equipment as rapidly as possible. This decision was arrived at in view of the fact that the exchange had reached a point where it was practically impossible to furnish satisfactory service, and something had to be done.

The Home company carefully investigated the merits of the various multiple systems then on the market, and after much thought and consideration—both on the part of the company's directors and engineers—the contract for the complete installation of the switchboard and telephones was awarded the Stromberg-Carlson Telephone Manufacturing

Company, of Chicago, Ill., and Rochester, N. Y., and on July 1, 1902, the new exchange was opened for service.

Photographs of the central office plant, reproduced herein, illustrate the apparatus installed, and no installation has been watched with keener interest, by those who are interested in telephone exchange matters, from the time the contract was closed until the cutting over of the old exchange on to the new board, because in Fort Wayne electrical prob-

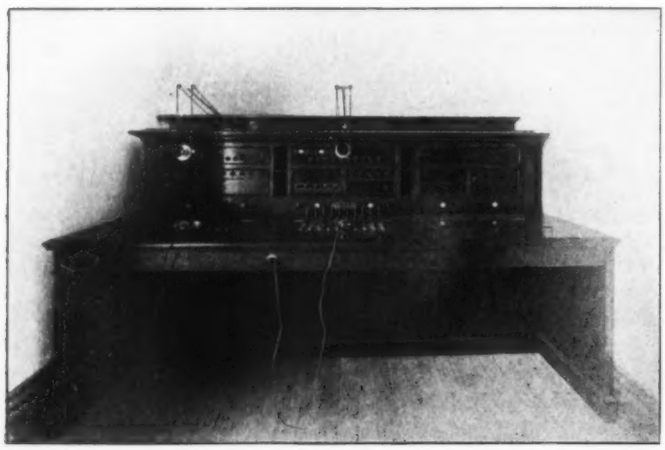


FIG. 1. TOLL BOARD, HOME TELEPHONE COMPANY

lems were presented which caused much skeptical speculation as to the successful outcome of the undertaking. Engineers of the Stromberg-Carlson Company asserted that a combination system such as would be required in order to operate a system of full metallic and common return lines jointly, could be successfully installed and operated. Not only were the engineers warranted in this confidence, as we know now with the completion of the work, but the successful manner in which all obstacles have been overcome, the cutting over from the old board to the new, and the replacing of the old style magneto telephones with central

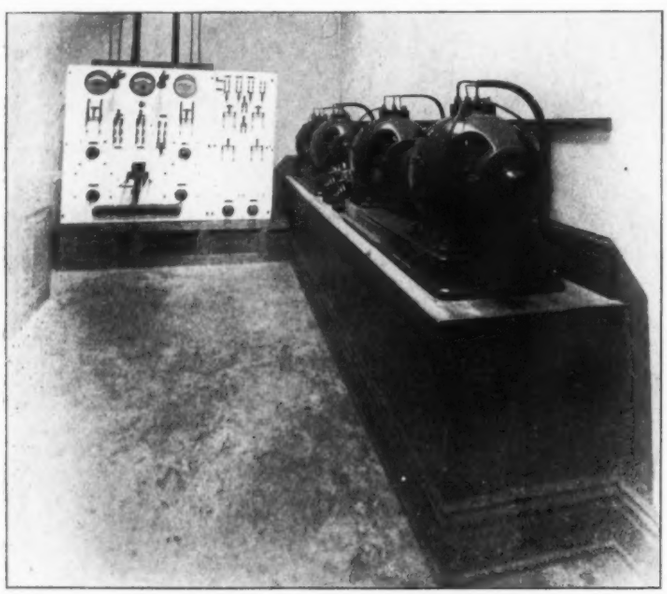


FIG. 2. POWER PLANT, HOME TELEPHONE COMPANY.

energy instruments, is highly complimentary to the engineers and installers who had the work in charge.

The present equipment of the switchboard is complete for 2,280 subscriber lines, with an ultimate capacity for 5,600 lines. Of the 2,280 subscriber lines, perhaps some four hundred are full metallic. The balance are on common return circuits. This was the condition that gave rise to doubt as to the successful outcome. It was well known that certain conditions could not be eliminated; the principal requirement, however, was to furnish the people of Fort Wayne with quick and satisfactory service; the question of making the exchange full metallic was to be dealt with gradually.

The exchange equipment is the most complete that money, engineering skill and modern apparatus can provide. The switchboard is equipped for a full metallic lamp line signal bridged multiple central energy system, with eleven sections installed at the present time, with an equipment for 2,280 subscriber lines, 120 lines to each operator's position. The photograph of switchboard, as reproduced, was taken a few days previous to the opening of the exchange. In addition to the subscribers' equipment, there are sixty incoming and sixty outgoing trunk lines, with an ultimate capacity for the installation of 240 trunk lines.

The circuits employed in the equipment of this switchboard and auxiliary apparatus are many of them entirely new, incorporating features for facilitating operation, and producing electrically more satisfactory results than found in many circuits formerly employed. Changes were neces-

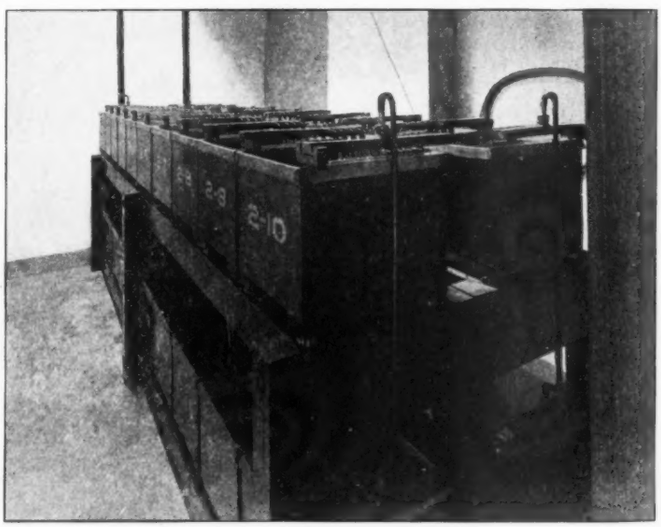


FIG. 3. BATTERY EQUIPMENT, HOME TELEPHONE COMPANY.

sary in many of the standard circuits, owing to the peculiar conditions surrounding the installation.

The auxiliary apparatus installed consists of three desks —monitor, chief operator and wire chief—and a 3-position toll-line switchboard. The desks are constructed of quarter-sawed oak, matching main switchboard in design and finish. Monitor's desk is equipped with supervisory lamps and listening-in circuits to each operator's position; and it is further equipped with a sufficient number of cord-connecting appliances, exchange line terminals, and terminals for direct wires to the different positions and offices about the building. Each pilot lamp in the main board is also duplicated in the monitor's desk. Capacity for the future growth of the exchange is provided for, and the installation of additional apparatus when required.

The chief operator and wire chief's desks are suitably equipped with line terminals, testing appliances and auxiliary apparatus for the present necessities of the exchange, with capacity and arrangement for additional apparatus when required.

The toll-line switchboard is for three positions of the desk type, constructed of the best quality of quarter-sawed oak, and finished to match the main switchboard. The present equipment consists of twenty toll and party lines—together with trunking facilities to the main switchboard

and branch exchanges. Fig. 1 illustrates the toll board, showing two positions equipped. The toll lines terminating on this board pass through the main switchboard at the toll or "B" position, where they can be handled at night, or at such times as it may be advisable to dispense with the services of the toll-line operators during the quieter hours. The toll position in the main switchboard is equipped with cord connecting appliances arranged for toll to toll service, and also for toll to central energy service.

The power plant, as shown in Fig. 2, consists of two, type 5 Roth twin motor generator charging sets, motor end wound for a direct current of 500 volts, with an output of 40 amperes from the dynamo, at 60 volts. These machines are provided with the Cutler-Hammer overload and no current release starting box, and a Roth round type field rheostat. Two Roth ringing dynamotors are installed; one a

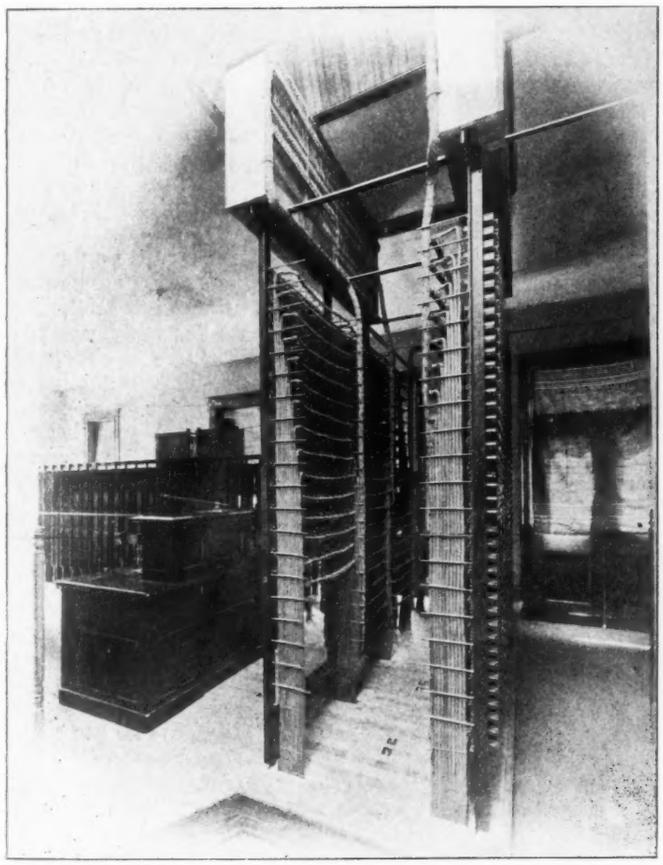


FIG. 4. TERMINAL ROOM, HOME TELEPHONE COMPANY.

one-half type with primary winding for 500 volts direct current, and a secondary output of 100 volts alternating; the other a one-quarter type ringing dynamotor, with primary winding for 40 volts direct current, and a secondary output of 100 volts alternating. Each machine is equipped with a Howler busy-back and periodic ringing attachment; also with the necessary automatic overload no current release starting boxes, copper hand wheel and index plate.

The storage battery plant consists of two sets of 20 cells each of Electric Storage Battery Company's accumulators, type F-19 lead lined tanks, equipped with type F-9 elements. Batteries are substantially mounted on heavy stringers and foundations, as shown in Fig. 3.

Figs. 4 and 5 illustrate the terminal room as photographed from two positions, showing also the wire chief's desk.

The main distributing rack, relay frame and intermediate distributing rack, are fully equipped for 3,000 lines, and arranged for additional growth in sections of 800. These racks are made of iron, of such cross-section and so braced as to be strong and rigid. On the arrester side of the main rack are mounted the Cook heat coil carbon and mica lightning arresters. The intermediate rack is constructed in the same manner, with arangement for the rapid handling of wires in cross-connecting, and equipped with a full number of terminals for the 3,000 lines. The relay frame is constructed much in the same manner, but with a view to the easy access of all line and cut-off relays employed in the exchange. These relays are mounted in banks of twenty, and are separately inclosed in tubular cases so as to exclude all dust and foreign particles from coming in contact with their working parts.

In Fig. 4 is shown, on top of the relay rack, a box, in which is temporarily placed the apparatus made necessary in view of the combination of the two systems, metallic and common return. This box is wired and arranged with a view to its ultimate abandonment, as it is the intention of the Fort Wayne company to gradually complete their system to a full metallic exchange, at which time the box and its extra apparatus—together with the cables—will be removed.

After much speculation and necessary experimental

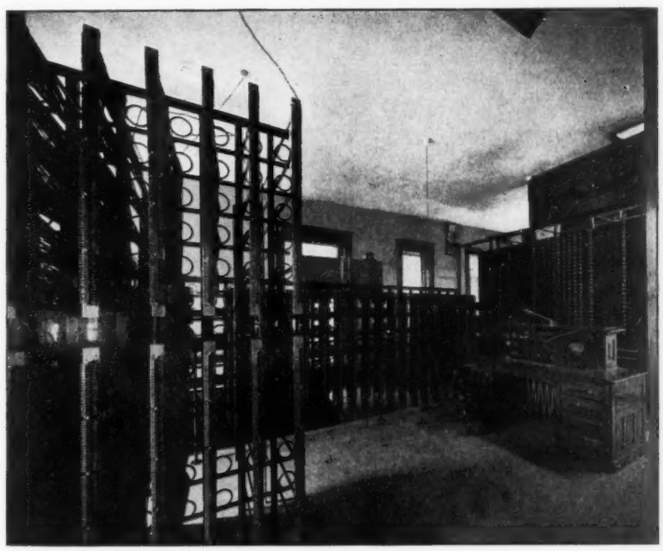


FIG. 5. TERMINAL ROOM, HOME TELEPHONE COMPANY.

work, some trials and difficulties that seemed insurmountable, and occasional disappointments, it is extremely gratifying to all concerned to know that the exchange has been successfully installed, and that Fort Wayne is unquestionably equipped to-day with one of the finest multiple switchboard telephone plants in the country.

AN EXCHANGE ON STILTS.

The exchange of the Youngstown (Ohio) Telephone Company, which has been on stilts for many months, while the building below was being rebuilt, has been lowered and now rests on the new block. The entire work of raising the top of the building, rebuilding the portion below and finally lowering the exchange portion into place, was effected without in any way interfering with the everyday operation of the exchange. The task of lowering the building was effected by huge screws. A trestle work of timbers resting on the steel beams of the second floor was built around the office, and into the top of this trestle were placed long bolts which were fastened into timbers extending under the office. The bolts were screwed up tight and held the office in place while the concrete floor was being laid to receive the exchange. When this was completed the work of lowering the suspended building was effected.

Decisions Affecting Telephony.

Prepared for TELEPHONY by Andrews & Murdoch, Berrien Springs, Michigan.

CONTRACT BY TELEPHONE.

An interesting point was raised in a suit in Rhode Island the other day. Dominico Delugi had contracted with Anthony R. Barney for his supply of coal to be delivered as requested. Delugi called Barney up over the telephone and demanded that the coal be delivered, but this was refused in the conversation over the wire. On this Delugi commenced a suit for damages on account of the breach of contract. The trial court refused to instruct, as requested by defendant, that "If the plaintiff demanded coal from the defendant by telephone, a refusal by telephone to fill such order is not sufficient to show that the defendant has broken the contract, and the defendant is entitled to a verdict." On appeal to the Supreme Court of Rhode Island the court said:

"We are unable to see that the request raises the question of law that has been argued. It expressly admits a demand 'from the defendant' and 'a refusal by telephone.' There can be no question of liability in such a case. The question argued was whether the plaintiff could be held to have proved a breach of contract by the defendant, so as to warrant a recovery, where such demand was denied by the defendant, and the only evidence of such demand and refusal were telephonic messages, without evidence of identification of the defendant or his agent as the person with whom communication was had. But these elements are not embodied in the request. Quite likely counsel and court may have understood the request as raising the question argued here, but we cannot know this. The record simply shows that the request was denied, without giving the reason. The only question before us is whether the request should have been granted as it stands, and we think it is clear that it should not."

Delugi vs. Barney, 51 At. Rep. 425.

LEGISLATIVE REGULATION OF TELEPHONE RATES.

A proviso added by congress to a regular District of Columbia appropriation act contained the following proviso:

"*Provided*, That from and after the passage of this act it shall be unlawful for any person or any telephone company doing business in the District of Columbia to charge or receive more than fifty dollars per annum for the use of a telephone on a separate wire; forty dollars for each telephone, there being not more than two on a wire; thirty dollars for each telephone, there being not more than three on a wire, and twenty-five dollars for each telephone, there being four or more on the same wire."

30 Stat. L. 525, 538, chap. 540.

The Chesapeake & Potomac Telephone Company threatened to remove its telephone from the office of J. Forrest Manning & Co., together with its appliances, and to discontinue telephone service to them, the trouble arising from the fact that J. Forrest Manning & Co. refused to pay higher rental for the service than fixed in the proviso quoted. Other patrons of the telephone company took the same position, and numerous bills were filed asking for an injunction to restrain the removal of telephones and discontinuance of the service. The bill filed by J. Forrest Manning & Co. alleged that the defendant was a corporation organized under the laws of the state of New York, and for a long time past engaged in the business of furnishing telephone exchange service in the District of Columbia; that with the assent and under the direction of the congress of the United States and the commissioners of the District of Columbia, it was occupying the streets, avenues and alleys of the city of Washington with its conduits and electric wires; that the plaintiffs had a contract with the defendant for such service, terminable by either party on ten days' notice, in writing; that the defendants had given notice of their intention to terminate such contract. The bill further alleged the passage by congress of an act limiting the charges for telephone service; that the plaintiffs desired to continue the use of the telephone service furnished by the defendant, and had tendered the amount required to be paid under the act of congress.

The defendant answered admitting its incorporation, its business of furnishing telephone service, the passage of the act of congress, set forth its contract with the complainants and the correspondence in reference to the termination of the contract, and alleged that the act of congress had no application to any individual desiring telephone service, but only to such service as might be rendered for the public to the District of Columbia; that if it did apply to individuals desiring telephone service the act was beyond the power of congress, inasmuch as the rates prescribed in it were arbitrary, unjust, unreasonable and unconscionable, because the service could not be furnished at the rates named therein without an actual loss to the defendant, thus practically working a deprivation of its property and property rights without just compensation or due process of law.

A preliminary injunction was granted restraining the defendants from removing the telephone and its appliances from the premises of plaintiffs or discontinuing its telephone service. A large volume of testimony was taken, and the case was submitted on pleadings and proofs. On February 28, 1900, a decree was entered dissolving the preliminary injunction and dismissing the bill of complaint, with costs. Mr. Justice Barnard, before whom the case was heard, was of the opinion that the rates fixed by the act were unreasonably low for the service and supplies to which they refer, and that, therefore, the act could not be sustained. An appeal was taken to the court of appeals of the district, which reversed the decree of the supreme court and remanded the case with instructions to enter a decree granting the permanent injunction, as prayed for. From such decree the case was taken to the United States supreme court on appeal.

The matter has just been heard by the supreme court of the United States, which has reversed the decision of the court of appeals and remanded the cause to the supreme court of the district with instructions to that court to set aside its decree and inquire as to the reasonableness of the rates. In rendering an opinion the court, among other things, said:

"Again, while a legislature may prescribe regulations for the management of business of a public nature, even though carried on by private corporations with private capital and for private benefit, the language of such regulations will not be broadened by implication. In other words, there is no presumption of an intent to interfere with the management by a private corporation of its property any further than the public interests require, and so no interference will be adjudged beyond the clear letter of the statute. Here the prohibition is against charging or receiving 'more than $50 per annum for the use of a telephone on a separate wire.' What kind of a telephone service is contemplated, and how much goes with the telephone? It appears from the testimony that there are two kinds of equipment, one more expensive and more reliable than the other; that some of the company's subscribers are using the cheaper and inferior equipment. Was the statutory limitation of $50 per annum intended as the limit for the superior or the inferior equipment? It also appears from the testimony that the defendant furnished to some of its customers, besides the mere telephone, such additional equipment as wall cabinet, desk auxiliary bells, etc., for which separate

charges are made. Doubtless these additional appliances facilitate and tend to make more convenient and easy the business of telephoning, but they are not included in the terms of the statute, and all that is required by its language is the furnishing of the telephone. What equipment and appliances are essential, and what only matters of convenience, may not be clearly shown by the evidence, but obviously there can be no difficulty in securing proof thereof. Suppose, for instance, a legislature should prescribe the rates for the carriage of passengers by a railroad. If the language was limited to the mere transportation of the passengers it would not be held to include accommodations in a sleeper, although such sleeper belonged to the company and was used on its trains. Of course, if the statute in terms prescribed charges for transportation carried on in the manner that it had been carried on, it might include all the conveniences which had been theretofore furnished by the company, but when the statute simply prescribes a rate for transportation it will include only the ordinary and necessary facilities for such transportation, and not those conveniences which make travel more comfortable. So here, if this statute had in terms prescribed that the company should furnish the same conveniences and facilities for carrying on the telephone business that it had been wont to do in the past, it would be held to mean the equipment heretofore used and to include all these auxiliary matters, but when it is limited to the 'use of a telephone' the courts cannot extend it beyond its terms and hold the statute to include things not named therein. The order which was directed by the court of appeals was one restraining and enjoining the defendant from removing from the premises of the complainant 'the telephone and its appliances by said defendant heretofore placed therein, and from refusing or neglecting to connect the same with other telephones upon being requested so to do, and from neglecting or refusing to furnish telephone exchange service to the complainants for the said telephone in the same manner as it has heretofore furnished such service.' In other words, the decree directed the defendant to furnish, for $50 per annum, the equipment with all the facilities and appliances which it had theretofore furnished, including, not merely the telephone on the separate wire, but the auxiliary matters heretofore refered to.

"It may be that congress, legislating simply for the use of the telephone, felt that the information it already possessed was sufficient to justify it in prescribing a reasonable charge therefor, at least for the inferior equipment, and did not wait for a full investigation in respect to the value of the use of the best equipment together with all these auxiliary matters. It may be that if all these matters are taken into account, and are within the purview of the statute, the conclusion of the trial judge was right, that no reasonable remuneration was furnished by the rates prescribed, whereas it may be that, excluding them, it will be evident, beyond question that the charges prescribed are reasonable and just. At any rate, the decree as directed by the court of appeals was erroneous and cast a burden upon the defendant to which it was not subjected by the legislation of congress.

"Before closing the opinion, one thing must be referred to. The court of appeals, not entering into any full inquiry as to the reasonableness of the charges, held that congress had a right to prescribe them, whether reasonable or unreasonable, and that, if in fact unreasonable and unremunerative, the only recourse of defendant was to retire from its business. This involves a question of constitutional law of great importance, upon which we at present express no opinion. The future investigation may relieve from any necessity of considering it. At any rate, it is well to have the facts settled before we attempt to determine the applicable law. And the facts should be settled by the trial court."

Chesapeake & Potomac Tel. Co. vs. Manning, 22 Sup. Ct. Rep. (U. S.) 881.

WELL KNOWN HEADS OF WELL KNOWN HOUSES.

Mr. I. J. Kusel, whose portrait appears below, is the president and controlling factor of the Eureka Electric Company, Chicago, and one of the pioneers in the Independent telephone field. Mr. Kusel is a product of Illinois, born in Chicago in 1865. He entered the general electric business in St. Louis in 1888 and continued therein until 1893, when he entered the Independent telephone manufacturing field. He was president of the Missouri Telephone Construction Company, one of the earliest factories devoted to the manufacture of apparatus for the Independents. From 1893 until the present time Mr. Kusel has been prominently identified with the telephone manufacturing business, and is well and favorably known throughout telephone circles. He has made many friends and is an example of what a young man can accomplish by close application to business.

I. J. KUSEL.

AUTOMATIC TELEPHONES IN FRANCE.

A recent cable from Paris says: "After exhaustive tests the French government has adopted the automatic telephone invention of a Russian engineer. The apparatus does away with 'Central' girls. The subscriber turns five disks, each numbered from 0 to 9, to form the number wanted, whereupon the correspondent is called automatically. If he is absent a sign soon appears saying: 'Rang one minute; no answer,' while the caller's number is registered at the other end, so that he may be called after the person sought returns. When the number desired is already 'busy,' a special buzz is immediately heard. In order not to dismiss all the telephone girls together, which might disturb the labor market, the new system will be introduced gradually.

Common Battery Points.

J. C. KELSEY.

Each particular common battery system has its particular advantages which the makers freely admit, and a few disadvantages which naturally the maker will not admit. Systems using relays, and they all use them, are limited as regards the distance of the subscriber from the central station. Then a question of transmission is involved, when the distance is so great, or the line resistance so high, so that the relays may not have current enough to actuate them. If there is not current enough to actuate a sensitive relay it would appear that there would not be enough current to be satisfactorily operated by a transmitter. There seems to be a question in many people's minds of the relative superiority of local and common battery. The long-distance man will not for one moment tolerate a common battery transmitter for his little toll board, when he can force the care of a local battery transmitter and three dirty, fickle Fuller cells upon the local switchboard attendant. In many large common battery exchanges to-day the only relics of 1885 practice is that of the long-distance people, still insisting upon Fuller cells, and a hot, sizzling transmitter. If it is possible that a local battery set gives better transmission than a common battery set, it is certainly proven that the makers of coils and transmitters are not equal to the task of making common battery instruments. The constant battery strength in common battery systems is certainly more conducive to steady reliable transmission than is the steadily decreasing strength of local, wet or dry cells.

Then in some common battery exchanges the management often advises people to go to certain local battery booth stations, because they can get better service. Such is a fatal admission. If such case is true, that the common battery subscriber gets poor long distance transmission service, it is time that the toll trunk, between the main board and the toll board be investigated. In a well-designed toll trunk circuit the common battery subscriber should get as good results as at a local battery booth station. In local exchange work the common battery subscriber twenty or thirty miles away will find his transmission just as good as a subscriber in the central office building. In a sense, within certain limits, transmission would be better, because certain side tones and noises will be modified. The first visible evil effect of distance or high resistance would be the failure of the relays to operate. This would indeed prove a body-blow to common battery practice.

Common battery systems may be divided into two classes:

I. Those which are designed for all classes of circuits, such as grounded, common return and metallic; and,

II. Those which are designed purely for metallic service.

The first may be called a repeating call system and the second a system whereby battery flows to subscriber through impedences, which serve as supervising relays.

When the large city exchanges adopted common battery practice, there was neither time nor inclination to put everything on a metallic basis, hence the necessity of some apparatus which would satisfactorily connect grounded and metallic subscribers without introducing noise due to unbalance of circuits. This was necessarily a type of a repeating coil, used formerly and used now in connecting grounded and metallic lines.

The ordinary type of repeating coil on the market will fail in one particular condition, that it will not quietly connect a grounded common battery subscriber to a long metallic subscriber station or a trunk line, which is closely associated with a paralleling trolley for several miles. And long lines, without much trolley disturbance, are particularly susceptible to unbalances. In the absence of a satisfactory repeating coil these long lines, and the particularly disturbed metallic lines and trunks, are taken care of by special apparatus.

A repeating coil system depends upon a non-inductive cord relay for supervision. It is necessarily non-inductive, made so by a German silver shunt in parallel with the copper winding, because transmission would be impaired by an inductive relay directly in the talking circuit.

Through 22 volts a non-inductive relay will work most satisfactorily through an adjustment to 750 ohms. Beyond 1,000 ohms, the adjustment is necessarily so fine as to cause the relay armature to act as if the core was magnetized. Thus may a subscriber become "hung up." Through 22 volts, an inductive line relay 100 ohm resistance should operate through 2,500 ohms with good safe adjustment. A 500 ohm relay with the same battery strength should work through 4,000 ohms and 5,000 ohms with close adjustment.

Before going into long line discussion, the effect of permanently grounded selective polarized bells should be observed. In selective ringing the general scheme is to put a high resistance cord in series with the polarized bell. If 1,000 ohm bells are used, then 5,000 ohm spools are put in series. If 2,500 ohm bells are used, then 3,000 ohm spools are put in series. Taking the latter case, on a four-party line, this means a parallel path to earth of two 5,500 ohm circuits. This would give a resultant path of 2,750 ohms on each side of the line.

This resistance will come dangerously near operating the line relay, unless it is specially adjusted. Not only the relay is affected, but the line is rendered noisy, especially those lines directly in the path of the return street railway current, for some of the earth current is bound to flow back through the circuit. Hence one hears the cars starting and stopping and even the fluctuations of the load at the power house generator.

Ofttimes the high resistance spools in series are defective and the inspector easily finds the trouble. Generally with no new spool with him, he short-circuits the defective 3,000 ohm or 5,000 ohm coil until he can get around with a new one, which event never happens. In this case if this coil was short-circuited on the battery side there would be a path to earth of two parallel circuits, 2,500 and 5,500 ohm respectively. The combined resistance will be then about 1,720 ohms. This will have a permanent effect on the line relay. The switchboard man finds that he can adjust the line relay to the widest extent, and that clears the trouble, as far as the permanency of the line signal goes. With widest adjustment even, the removing of the receiver hook energizes the line relay, and closes its armature contacts through the line lamp and battery. The operator answers, extinguishing the line lamp and transferring the control of the connection to the cord relay. When the party hangs up his receiver the cord relay should release its armature. But it does not, because enough current is flowing to earth through the 1,720 ohm ringer circuit and the cord relay to permanently retain its armature. This is a great disadvantage, because a subscriber, once plugged up, is "hung up" because he has no means of attracting the operator's eye either by waving the receiver hook up and down or hanging up permanently.

If the traffic manager has instructed operators not to inquire into nor pull down a connection till both supervisory signals are lighted, there is certain to be complaints from any of the four parties on the line, for the reason they cannot get a second connection from the operator. If two lines were affected this way one can see that both parties, upon finishing conversation, are without proper disconnect signals.

Such a method of selective ringing is conductive to much trouble, not only making lines noisy, but interfering with clean action of the various relays.

When lines are twenty miles or more in length, with circuits of iron, and with bad joints, the resistance will range from 1,000 to 3,000 ohms. Here is a natural cause of relay trouble, and a serious one.

If such cases had no remedy then common battery exchanges would be useless for localities where distances are great, for instance a county seat, with lines extending to all corners of the county. Experience with the ordinary repeating coil showed that:

I. To connect a grounded line to a short metallic line, undisturbed by induction, of trolley, causes no noise from unbalance.

II. To connect a short metallic line, free from inductive disturbance, to a long metallic line greatly disturbed by inductive troubles, causes no noise from unbalance.

III. To connect a grounded line to a long metallic line, or trunk, however well transposed, causes such a noise and roar from unbalance as to prohibit conversation.

It is obvious, then, that if a long line be divided into two parts, separated by a repeating coil at the exchange, we have conditions of short metallic connected to long metallic with no unbalancing conditions. To connect the short metallic part of this circuit to a grounded circuit still gives us conditions of balance and quiet. Therefore, if the long metallic line has perfect balance and quiet when connected to the short metallic line, and the short metallic line preserves balance and quiet when connected to a grounded line, then the long metallic line, however much disturbed by trolley induction, will have perfect quiet and balance when in connection with a grounded line.

In the long line between the intermediate and main frame a repeating coil is placed, with condensers at middle points of each side of the coil.

As it now stands, Fig 1 shows that the long line subscriber has no battery supplied to his station, and is accordingly unable to use it.

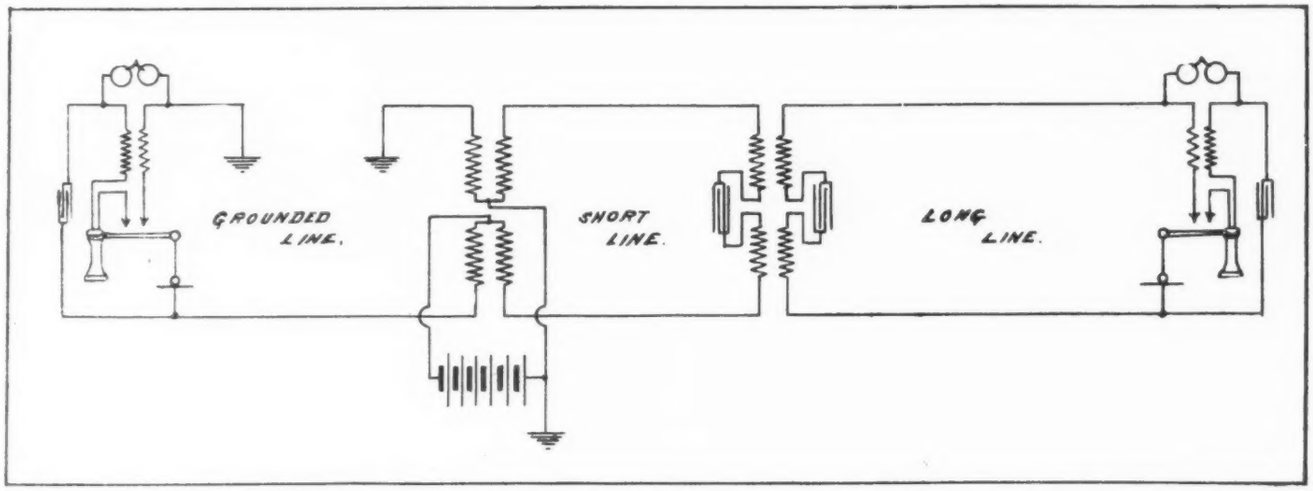


FIG. 1.

Battery is supplied to the long line through two well-balanced hundred ohm relays connected to the middle points of the repeating coil. This preserves the balance of the line, and gives the line two very sensitive relays which will operate through 3,000 ohms.

The armature contacts of one of these auxiliary line relays are connected to the middle points of the repeating coil on the exchange side, so as to short circuit the condenser, and allow current to flow through the line relay proper. If the armature contacts short circuit the condenser, the discharge of the condenser welds the contacts, and holds the signals of the exchange permanently. Such a case is remedied by a small resistance in the circuit, which reduces the intensity of the spark of condenser discharge.

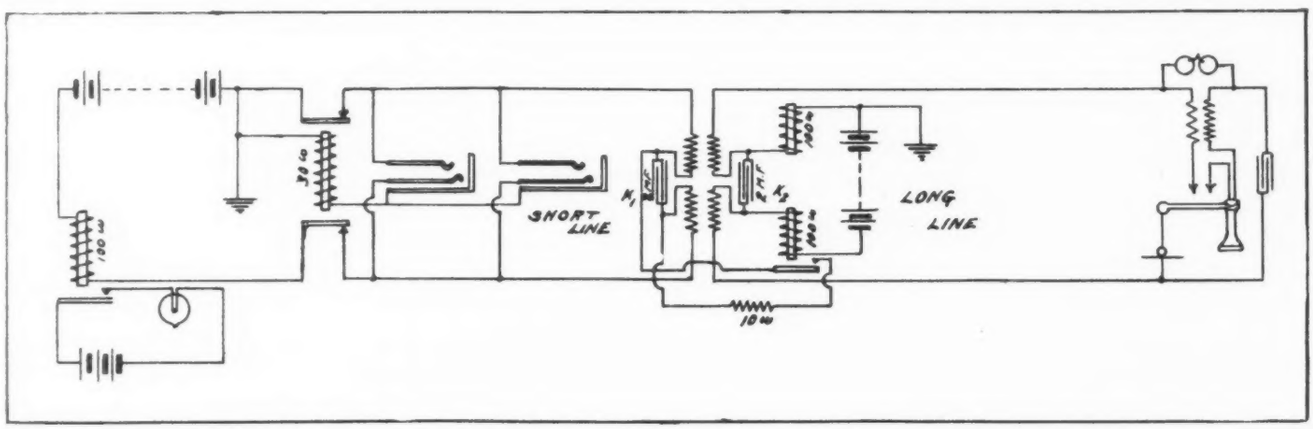


FIG. 2.

If the subscriber removes the receiver the two relays out on the line side are actuated. One of these relays closes the line circuit of the short exchange metallic line, which actuates the line relay proper. The operator plugs in and transfers control of connection to the cord relay. As this relay will not operate successfully through resistances up to 2,000 ohms, in this scheme such a possibility is removed.

The cord relays, and line relay too, now operate through a very low resistance, and allow of standard adjustment.

Instead of every cord relay in the exchange being closely adjusted just to fit conditions of a few long lines, this special apparatus makes long line operation act as if it were a short one, not only in operation of relays, but in connection with a grounded line as well. See Fig. 2.

This apparatus necessitates ringing a subscriber's bell inductively, and if ringing is weak the addition of two condensers to each of the original special condensers will remedy the trouble.

But long lines are generally used as party lines and selective ringing is desirable. Such a circuit above described does not permit of selective ringing.

To provide for a two-party ring, with alternating current, out on each side of the line requires two extra relays and condensers. The relays are of the double contact cut-off type.

To provide four-party ringing, with pulsating currents, requires four extra polarized relays, with a high resistance coil, in series, instead of condensers, to prevent permanency of signals.

As it is bad practice to change the general system of operating for special service on a few lines, the selective ringing method must act automatically; that is, ring out on the line while operator is pressing ringing key. The operator is entirely ignorant of the existence of any special apparatus or service.

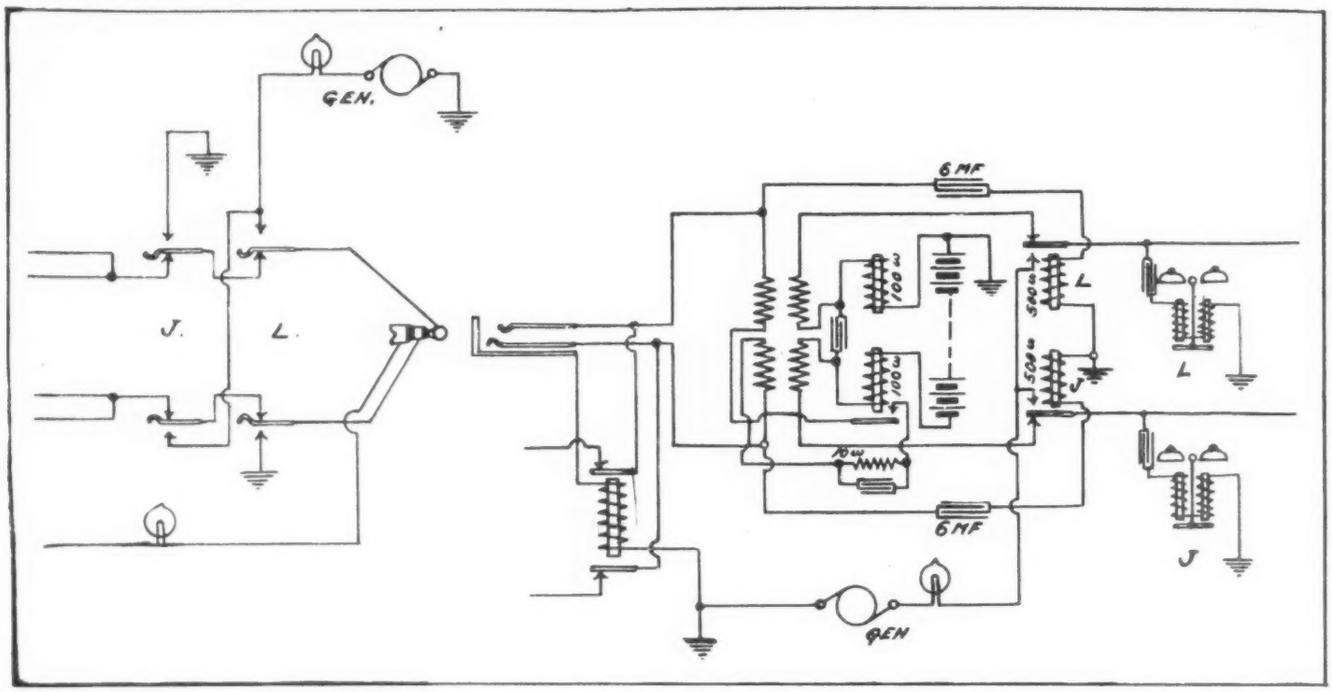


FIG. 3.

To ring J party, depress J key. Fig 3. The alternating current finds only a path from ring springs to the 500 ohm relay and condenser to ground. Flowing through relay, it actuates it and holds its line spring against the generator contact, which ringing current seeks the ground through J subscriber bells. The presence of the condenser forbids passage of continuous currents and gives no permanency to signals.

To ring L party on other side, depress L key. The alternating current finds no path except from tip springs through condenser and 500 ohm relay. This likewise is actuated and puts its line spring against the generator current, which seeks the earth through the "L" set.

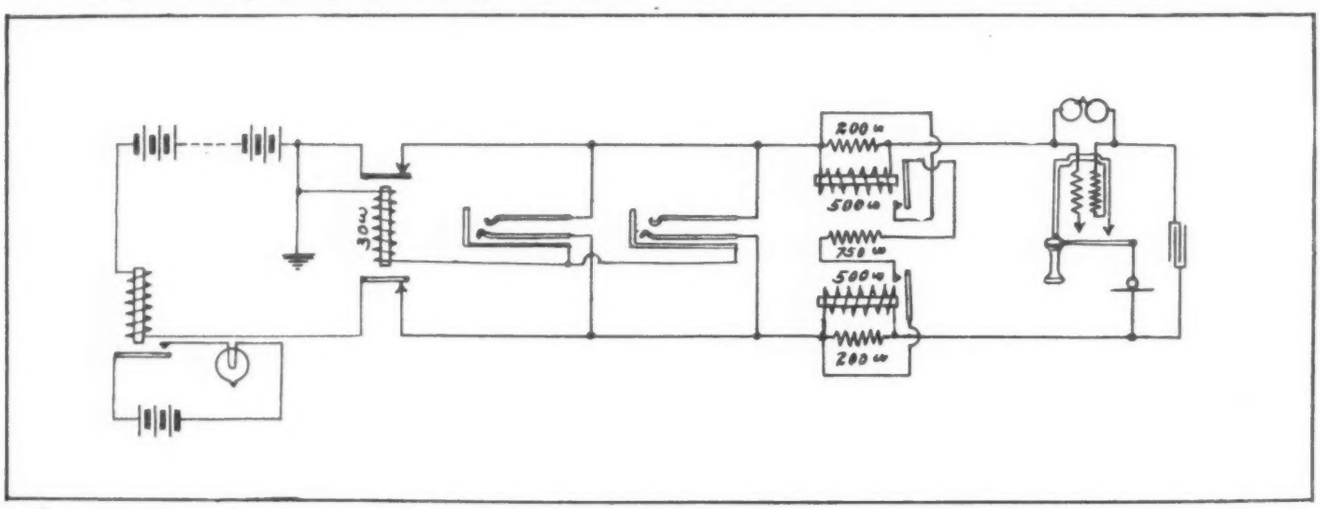


FIG. 4.

The condenser K, on switchboard side has to be removed, as its presence induces current into the line and taps the bell on opposite side of the line wanted. Both parties are always with line battery except when the line is opened to send out alternating instead of continuous currents.

The operation for four party selective ringing employs the same general principle, with the substitution of resistances for condensers.

The improvement of the repeating coil releases us from taking measures to preserve the balance of the line, because that is the proper function of a repeating coil. The only necessity remaining in long line service is the automatic reenforcement of the line when the subscriber removes his hook. The cord relay demands a low resistance, and this must be furnished in bridge every time the telephone is off the hook. The lowest bridge across the line to permit of good transmission is not below 500 ohm. To bridge 750 ohms will at all times actuate the least sensitive relay in the exchange.

To insert two sensitive inductive relays in the line would be detrimental to transmission.

To insert 500 ohm relays, and shunt them with 100 or 200 ohm non-inductive windings would not affect transmission, nor would it bring the sensitiveness of a 500 ohm relay below action through 3,000 ohms.

This circuit (Fig. 4) interposes nothing to interfere with selective ringing. To ring on one side of the line would agitate that relay on that particular side of the line, but the opposite relay would not, and hence the 750 ohm bridge would not be pulled up into a shunting relation with the subscriber's ringing sets.

In selective ringing the circuit needs a clear path through the bells. Enough trouble comes from other causes without robbing the bells of a fraction of ringing current.

Such a circuit would be useless on a grounded line, as only one relay would operate. In this case make the bridging resistance depend upon one relay contact. To ring selectively through a repeating coil has proved advantageous when used in conjunction with isolated toll boards, located out of town, and trunking to the various exchanges in one or more cities.

In such a circuit the toll operator gives order wire instructions for a certain jack number over a certain trunk. This holds that line busy and no one can use it. When the toll operator secures her party, if within ten minutes, she simply rings on the trunk and calls the subscriber desired without the intervention of the "B" operator.

When connection is finished, a suitable disconnect signal provided tells "B" that connection is no longer needed. The usual practice is for the "B" operator to set the key for selective party called, and when the toll operator rings on trunk the calling or ringing relay is energized and brings its line springs into contact with generator currents of desired polarity.

Common battery admits J many ingenious devices. Most defects are easily detected by the factory experts and are remedied before being put on the market.

PERSONAL.

H. H. Hipwell, of the Hipwell Manufacturing Co., Allegheny, Pa., visited Chicago recently.

Chas. Stevens succeeds F. Parrett as manager of the Independent Telephone Co. of Princeton, Ind.

Thomas W. Hopkins has resigned his position as local manager for the Citizens' Telephone Company of Galveston, Texas.

It is currently reported that Professor Alexander Graham Bell has invented an airship, utilizing the principals of the kite.

Messrs. Kemster B. Miller and W. W. Dean of the engineering staff of the Kellogg Switchboard and Supply Company are on a hunting expedition in Colorado. Game—not trade.

L. Sands, president of the Williams-Abbott Electric Co., Cleveland, is making a trip through the West combining business and pleasure.

L. G. LeBauverau, representing the Sumter Telephone Manufacturing Company of Sumter, S. C., is making Chicago his temporary headquarters.

C. A. Rolfe, president of the Rolfe Electric Co., of Adrian, Michigan, accompanied by his wife and daughter, have been visiting in Chicago of late.

J. A. Russell has accepted the management of the very recently established western branch of the Hipwell Manufacturing Co., at 69 West Jackson Boulevard, Chicago.

The new manager of the Grayville, Illinois, telephone exchange, Mr. M. R. Haskinson, was formerly an employe of the Cumberland Telephone Company of Evansville, Indiana.

Mr. Frank B. Cook is in the West on business and pleasure bent, Los Angeles, California, being his objective point. He will return by way of Portland sometime this month.

Mr. Alfred Stromberg, of the Stromberg-Carlson Telephone Manufacturing Company of Chicago, has quite recently returned from an extended visit to his old home in Stockholm.

Wm. D. Booth, formerly of the Western Telephone Construction Company, and well known in manufacturing circles, has accepted a position with the Standard Telephone & Electric Company.

Frank G. Jones, president of the American Electric Fuse Company, has been devoting most of his time during the past month supervising construction details at his Adrian, Michigan, factory.

John F. Tompkins, for several years purchasing agent for the Sterling Electric Company, has accepted the position of chief clerk with Mr. Frank B. Cook, manufacturer of telephone accessories, Chicago.

F. F. Sapp, manager sales and advertising departments of the North Electric Company, Cleveland, Ohio, visited Chicago for ten days during the past month. Mrs. Sapp joined her husband before his return home.

Mr. A. J. Briggs, general manager of the Chicago Telephone Supply Company of Chicago, has been devoting his entire time during the past month to supervision of details about his company's big new factory nearing completion at Elkhart, Indiana.

The new vice-president and general manager of the Electric Equipment Company of Chicago, Mr. J. W. Peterson, was formerly with the Northern Electrical Manufacturing Company in an important position. He has also been identified with the Stanley Electric Company and is highly qualified for his new position.

G. H. Lutz of St. Joseph, Missouri, consulting electrical engineer and an enthusiastic advocate of Independent telephony, visited Chicago recently and stated that the Independent associations of Kansas and Missouri are endeavoring to better conditions by adopting the suggestions offered by Mr. A. L. Hutchinson in his paper read before the Wisconsin Independent telephone convention at Waupaca.

Mr. Frank B. Miller has accepted a position as salesman for C. J. Harrington of New York, and will travel in New England. Mr. Miller was formerly associated with the Worcester & Webster Street Railway Company of Worcester, as superintendent and passenger agent. He enjoys a wide acquaintance in his new field and is thoroughly conversant with his employers' line of machinery and general supplies for electric and steam railways, telephones, etc.

Raw Material Used in Telephone Apparatus.

A Series of Articles by H. M. Deavitt.

SAL-AMMONIAC.

Sal-ammoniac, or ammonia chloride, as it is technically called, consists of 33.75 parts of ammonia and 66.25 parts of chlorine. It can be made in a variety of ways, but on a commercial scale is utilized as a by-product, being recovered from the gas liquors in the gas house. The yield from one ton of good gas coal is approximately 10,000 cubic feet, 16 candle-power gas, 1,400 pounds of coke, 120 pounds tar, 20 gallons ammoniacal liquor. This ammoniacal liquor is the residue from washing the illuminating gas of its impurities, and its value depends upon the percentage of ammonia contained therein. More or less tar is always mixed with the gas liquor, but, on standing, this settles to the bottom of the tank. The clear liquor is then distilled to separate the ammonia, and the gas as it is condensed meets a stream of hydrochloric acid of such strength as to just saturate the ammonia. The action of the hydrochloric acid on ammonia water converts it into ammonium chloride. An excess of acid is to be avoided, as on concentration it would attack the metal pot in which it is boiled.

The solution is boiled down to the crystallizing point, either in leaden or iron vessels, and allowed to cool. The crystallized chloride is more or less discolored by tar and is purified by sublimation in earthenware vessels, the crude salt being first mixed with 20 to 30 per cent of its weight of powdered animal charcoal, then dried over a good fire, and next put in stoneware sublimation vessels. These pots are covered with thick concave metal plates. The sublimation is carefully conducted, and goes on slowly, lasting about 12 to 16 hours; after this the leaden plates are removed, the cake of sal-ammoniac from 2½ to 4 inches thick; when quite cool is scraped clean with a knife, and afterwards presents a perfectly crystalline appearance. To obtain it free from iron, the crude salt should be mixed before sublimation with about 5 per cent of superphosphate of lime, or with 3 per cent of ammonia phosphate; by this addition, any iron chloride is decomposed and left in the retort as phosphate.

As the material from which ammonia chloride is made, as well as the sal-ammoniac itself, comes in contact with iron in the various stages of its manufacture, it is difficult to remove the last of iron. It is because of extra refinings necessary to remove the last traces of any impurities that make the chemically pure substance a great deal more expensive than those used commercially for purposes where a small quantity of foreign material does not do any harm.

Since ammonium chloride is a perfectly white crystalline substance, it is easy to adulterate it with other similar-appearing material, which to the naked eye looks to be absolutely pure, but upon analysis, or when put to a practical test in a battery, it is not what it at first appeared. The substances added to cheapen the cost are generally sodium chloride or salt, sodium sulphate or ammonium sulphate.

Sal-ammoniac which is from 90 to 95 per cent pure is well adapted for use in galvanizing iron, but is not pure enough for electrical purposes. Chemically pure sal-ammoniac, on the other hand, is too expensive to be used for this purpose. There are at the present time brands of sal-ammoniac on the market which will test above 99½ per cent pure, and at only a slight advance in price over inferior goods, and which are specially prepared for battery service, and have given excellent satisfaction. It is poor economy to try to save half a cent a pound if in so doing a salt is obtained which is only 98 or 99 per cent pure, and thus invite the danger of rendering your battery useless.

One-quarter of a pound of sal-ammoniac is sufficient for a charge for a single-wet battery, but if the charge mixed with other salts is added, internal resistance increases and the service is very unsatisfactory.

A telephone house recently sent out to their customers a consignment of battery cells, together with the necessary sal-ammoniac, which to all outward appearances was the same as had been sent them on previous occasions. Soon a complaint came back that the last batch of batteries was not as good as they had been accustomed to receive from them in the past. When the telephone house referred the complaint to the battery manufacturer, an investigation was made and he reported the batteries were being made with the same care that they had always exercised, and that as far as they were able to discern, they were of the same quality as the factory had always turned out. The solution of the difficulty came when an analysis of the sal-ammoniac was made, which showed it only 97 per cent pure. When new sal-ammoniac of the proper purity was shipped, the same batteries which were so unsatisfactory at first, gave as good service using the new sal-ammoniac as any of the previous ones. The above case is a common illustration of the result of thinking the material is all right because the same brand was used for years without trouble.

It has been recommended in an article recently published on batteries that by the application of certain simple tests an inexperienced person can tell whether the sal-ammoniac is pure enough. That if a small sample of it was placed on a piece of platinum foil and heat applied to it, there should be no residue if the sal-ammoniac is pure. While pure ammonium chloride will entirely volatilize, it might be heavily adulterated with ammonium sulphate and still leave no residue, as the latter is as volatile as the former. Another test there given was to add to a solution of the sal-ammoniac in water, barium chloride and hydrochloric acid, and the impurities would be shown by a white precipitation when the liquids came in contact, if any were present. There might be an adulteration of 25 per cent of sodium chloride or common salt and it would not show in this test. It is true that these two tests combined in the hand of an expert who understands thoroughly how each element is related to the others might prove of some value to him, but in the hands of the novice or amateur who has had no experience in using chemical solutions, the conclusions he might be able to draw would be worse than nothing, as he would simply be deceiving himself. A man without any knowledge of chemistry, trying to make chemical tests, is like a man with a spattering of law endeavoring to be his own attorney—the farther he goes, the deeper the water he gets into. It is better, instead of guessing whether the sal-ammoniac is all right, whether it contains this or contains that, to have a person who has had experience in such work, analyze it, giving the exact percentage of every different ingredient found therein.

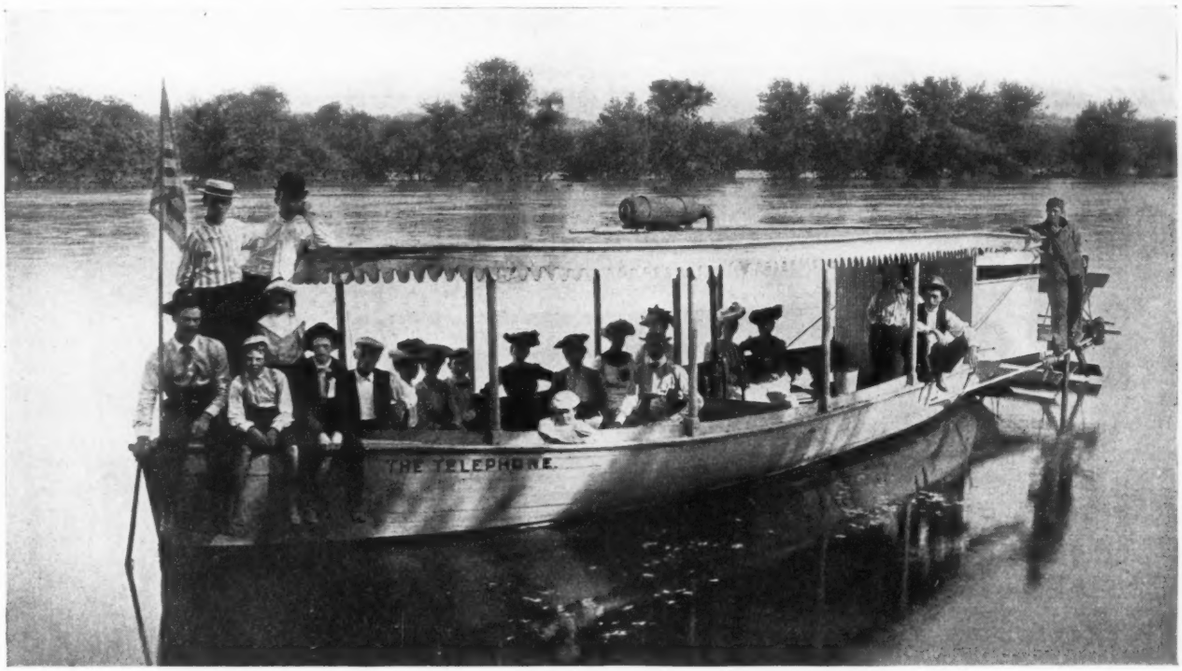
NEW TELEPHONE LINES FOR ITALY.

The Italian minister of posts and telegraphs has presented a bill with a view to the construction of 73 new lines of telephone, which will place the principal towns of the kingdom in direct communication with eacl. other. The project also includes the construction of three international lines: Genoa, Vintimilli and Marseilles; Turin, Vintimilli and Marseilles; and Turin, Mount Cenis and Lyons, which will have connections with the Paris-Turin line, which is already being largely availed of. The project will cost upward of 5,800,000 lire and will require eight years to complete.

VAN ANTWERP'S TELEPHONE SYSTEM.

Twenty-seven miles north of Peoria, Illinois, is situated the village of Sparland, the home of T. Van Antwerp, the well known telephone man, who owns and operates three hundred miles of telephone line, and eight exchanges. Mr. Van Antwerp has made his home county a network of Independent telephone lines, and undoubtedly has the distinction of owning more miles of telephone line than any other single individual in the United States. The system had a small beginning, when a line was installed for private business through the deep, rocky ravines and wooded hills which lie on either side of the beautiful Illinois river. This venture proved to be such a convenience that a demand for extensions soon made itself felt which with his customary energy Mr. Van Antwerp has been trying ever since to satisfy. After experimenting with every known make of telephone it was finally decided that Chicago telephones with laminated magnets and six bar generators give the best results in rural party line work and the last five hundred telephones installed on this system were made by the Chicago Telephone Supply Co. Mr. Van Antwerp gives close personal attention to the management and extension of his system, and in this work is ably seconded by his son Edward, who acts in the capacity of chief electrician. All subscribers enjoy both night and day service covering eight counties and also direct connection with the long distance system. This gives all subscribers access without leaving their homes or places of business to all of the larger cities as well as to neighboring towns and counties. One of Mr. Van Antwerp's hobbies is shown in the illustrations accompanying this article. He shrewdly says that such actions not only give him pleasure and promote good feeling among his employes, but actually pays a dividend because a cheerful operator makes and retains friends for his system. This must be true because competition has never been able to divert the loyal support which Mr. Van Antwerp enjoys.

One of the assets of this enterprise is the Naptha launch, "the Telephone," on which the employes of the system take frequent outings by invitation of the proprietor. Henry islands on the Illinois river are among the most picturesque islands in the state, and are usually the objective point of such outing excursions.



VAN ANTWERP'S NAPTHA LAUNCH, "THE TELEPHONE."

Such men as Mr. Van Antwerp, who have the courage of their cheerful and optimistic convictions set an example well worthy of emulation.

KANSAS TELEPHONE ASSOCIATION MEETING.

The following circular calling attention to the coming convention of the Kansas Independent Telephone Association has been sent out by Mr. Charles E. Wells, secretary of the association. It is expected this will be the largest meeting as yet held. The circular follows:

Gentlemen:—The replies to the circular recently mailed you regarding coming meeting, indicates a very general interest, over 80 per cent of the companies addressed having signified their intention of being represented, and a majority favoring Kansas City as place of meeting. It is found necessary, however, to postpone the date two or three weeks in order to perfect arrangements for program, railroad rates, entertainment, etc. The meeting will be held at Kansas City on Thursday and Friday, September 11th and 12th. Program giving headquarters, rate arrangements, etc., will be mailed you as soon as completed.

We have the assurance of the hearty co-operation of the Kansas City Home Telephone Co., who will lend all possible assistance in making the meeting a success. We are convinced that the rumors so industriously circulated regarding the sale of the Home franchise, have not the faintest foundation in fact, and that they emanate from, or are instigated by, Bell interests. Facts will be presented at this meeting which, we think, will effectually "squelch" these rumors, and it should be in our power to materially assist the Kansas City Home Telephone Co. Prior to the time of issuing program the secretary would be pleased to receive suggestions from any members regarding matters they may wish brought up at the meeting.

Kindly bring with you maps showing the Independent construction in your territory. A rate of one and one-third fare for the round trip, certificate plan, will be secured, and we hope to get a rate of one and one-fifth. Come and bring every "neighbor" who is eligible to membership. Yours truly,

CHARLES E. WELLS, Secretary.

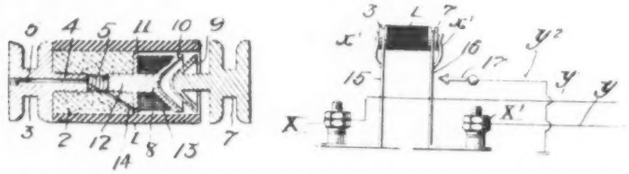
Digest of Telephone and Kindred Patents.

CONDUCTED BY EDWARD E. CLEMENT.

JULY 8.

704,439—Frank B. Cook, thermal protector for electric circuits.

It is perhaps unnecessary to introduce Mr. Frank B. Cook, late of the Sterling Electric Company and now in business for himself in Chicago. Mr. Cook was connected with the Bell Telephone Company for a long time, before he entered the Independent field. During that time he made many inventions, some of which are in use by the different Bell companies to-day. The present invention was first produced in 1891, and it is understood that in the usual course of procedure Mr. Cook offered it to the Bell company. They did not take it by purchase, and under the terms of his contract he was delayed several years in filing the application for patent. The invention is one of some considerable importance, and the several patents which have been issued as divisions of the original case cover with considerable breadth the field occupied by Mr. Cook's heat coil sneak current arresters, and high potential protecting-devices. In the present case, as shown in the drawing herewith, the sneak current arrester has flat heads with reduced necks to fit into the forked ends of the contact springs connected to line, and these heads are joined by a stem whose continuity is interrupted by a joint made with solder adapted to soften at a predetermined temperature. At one side of this fusible joint another break is made in the stem, and the two parts united by an insulating collar. A heat coil is wound on the stem close to the fusible joint, and this coil is



704,439—THERMAL PROTECTOR FOR ELECTRIC CIRCUITS.

inserted between the left hand head, and the portion of the stem upon which it is wound, the complete circuit thus being from the left hand head to the heat coil by the wire shown, thence to the stem, and thence through the fusible joint to the right hand head. With this protective device mounted in the springs as shown, if an excessive current is passing, it will by heating the coil soften the sodder, permitting the spring pressure to pull apart the stem at the fusible joint, and the right hand spring, after thus breaking the line circuit to close the ground circuit.

Mr. Cook's claims when they get into court, will be interpreted in view of the art as it was at the time he made his invention, and he will have all the advantages due to success in interference litigation during the pendency of the applications. Mr. Cook was placed in interference with F. R. McBerty, of the Western Electric Company in 1897, a similar invention being found in Mr. McBerty's original patent No. 544,368, dated Aug. 13, 1895, for which a reissue application was pending at that time. Decisions were rendered in favor of Mr. Cook by the examiner of interferences Dec. 12, 1898, by the examiner in chief, March 7, 1899, by the commissioner of patents May 31, 1899, and finally by the court of appeals of the D. C., Feb. 13, 1900. Mr. Cook was represented throughout this litigation by Charles C. Bulkley, Esq., the well-known attorney of Chicago. His success is a matter of interest to Independent telephone men, and of considerable importance to many, because if McBerty had prevailed in the contest, his success would have resulted in another batch of suits by the Bell company. If tribute has to be paid for the use of an invention, it will be some satisfaction not to be deprived of the benefits for which it is exacted.

Of the nineteen claims in this patent, four are given below as specimens:

"4. The combination with a small resistance coil, of a spool of good heat conducting material upon which the coil is wound, a stem secured to said spool by easily fusible solder, a spring adapted to move said stem out of contact with the spool when the solder is fused, and an electric circuit including said coil, spool, solder and stem in series; whereby the detachment of said stem from the spool effects the opening of the circuit."

"6. A normally closed circuit comprising an instrument to be protected, a line, a heat coil and a spring switch, together with a normally open circuit to earth only, and means operated by the heat coil whereby the spring switch closes the normally open circuit, and opens the normally closed circuit."

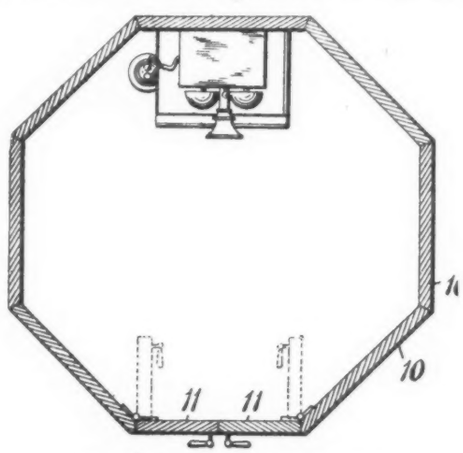
"14. A conductor made in sections and having its opposite ends formed with reduced headed portions, a connection holding the sections together, flat supports insulated from each other and having their ends notched to receive said reduced headed portions, one of said supports being flexed or sprung so as to pull on the said connection, and a heat concentrating member arranged to cause said connection to weaken and break, so as to allow the flexed support to pull the conductor sections apart."

"17. A thermal cut-off comprising a stem and core, connected by solder, in a coil of wire, between two posts, one of which is a spring pulling upon the solder, away from the other, all in the circuit."

704,987—F. L. Tufts, telephone booth.

After filing the case just commented on above, Mr. Tufts apparently found certain faults in his circular telephone booth, and the invention in the present case is an effort to improve the same. He uses here octagonal booths. He says, in regard to this change in shape:

Since filing my application No. 81,232 on November 5, 1901, I have been experimenting with sound transmission, and I find that a tube, for instance, which is circular in cross-section will transmit high notes as well as and per-



704,987—TELEPHONE BOOTH.

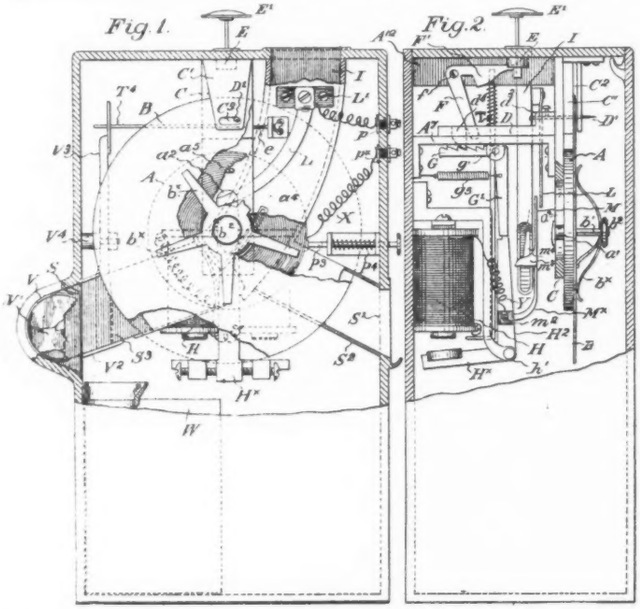
haps better than a tube which is flat-sided; but, on the other hand, the low notes are cut out by the circular tube, and the flat-sided tube carries them much better. In making these experiments I have found, too, that certain tones, and perhaps most tones, can be kept within a booth if it is made octagonal or polygonal in shape, or, in fact, if its broad sides are broken, so as to be less than the sides of a rectangular booth in width. In carrying out this idea the walls are so braced in different directions as to prevent the vibratory and sounding-board effect. Further, as the

circular form of booth cuts out certain tones and the flat-sided booth cuts out certain other tones I have found that by combining these two ideas and inclosing a circular booth within a structure having flat sides (even a rectangular outer structure will do) all tones are practically confined to the booth, and so the person using the telephone is in no danger of being overheard from without.

JULY 22.

12,015—J. B. Gill, toll collecting and call recording device for telephone systems.

This is a coin-receiving box for pay stations having three principal features. The first consists of means whereby the coin is retained in the chute and not deposited in the box until the operator at central sends a suitable current impulse over the line. This enables the person depositing the coin to recover it or not at the will of the operator. The second feature consists of a device for exhibiting the coin after it is deposited and the operation is complete, and leaving it on view until the depositing of the next coin. The



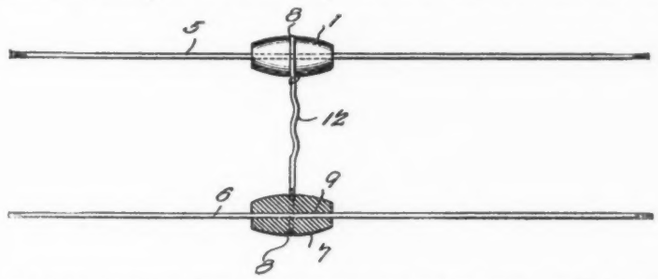
12,015—TOLL COLLECTING AND CALL RECORDING DEVICE FOR TELEPHONE SYSTEMS.

third feature consists of a circular record sheet in which a hole is punched with a needle, for each coin deposited, and the sheet advanced a step for the next operation.

The patent is a reissue of original patent No. 635,378, Oct. 24, 1899.

The apparatus is somewhat complicated, by reason of the multiplication of parts, and only a brief synopsis of the operation will be attempted here.

When the user of the telephone wishes to call he deposits the proper coin in the chute 1, and this coin after being released as referred to later, passes down the chute until it strikes a cam projection m4 on a spring Mx, which is attached to, but insulated from the bell-crank armature-lever H2 of the magnet H, which is in the line circuit. The coin is prevented from leaving the open end of the chute by the projecting finger m3 of the spring Mx, and as it presses this spring to the right (Fig. 2), the line circuit is closed at L M, thus sending a signal to central. Having deposited the coin, the user then presses down the push button E′ on the top of the box. As shown in Fig. 2 (this being a transverse section and Fig. 1 a longitudinal section), the push-button E′ presses down the arm F′ of a bell-crank lever, the other arm of which, F, throws back the slide D carrying a needle D′, and when so thrown back the slide is held back by the tooth d4 taking into the ratchet G, which itself constitutes the upper arm of a bell-crank lever whose lower arm, G′, is controlled by the armature lever H2. The push-button also pushes down, through the intermediation of the arm F′, the spring pressed rod T, which by means of the cross-head arrangement removes an obstruction from the path of the entering coin and permits it to drop onto the cam m4, and also works the system of levers T4 V3, to push aside a cover V2 under an opening in the lower chute S3, whereby the previously deposited coin is released from the glazed projecting window V V′, where it had been on exhibition, and permits it to drop into the box W. The rod T



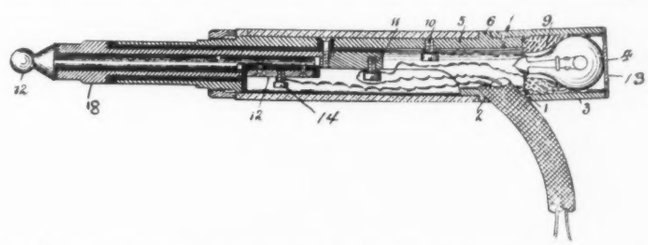
705,073—DEVICE FOR PREVENTING HUMMING OF TELEPHONE WIRES.

also pushes down the armature Hx, to insure its being in operative position for recording.

The recording is effected by means of the needle D′ on the slide D, punching through a paper disk B, supported on the front of a rotatable metallic disk A, by means of spring fingers bx. This disk is rotated and raised simultaneously in rather an ingenious manner. The spindle b′ works vertically in a slot a2 in the supporting bracket C. In the back of the disk A is produced a spiral channel, and in this channel works a pin a5 on the frame. Thus when the disk is rotated it gradually screws itself upward, and the rotation is secured by a movement of the needle D′, the slide D being jerked to the right (in Fig. 1), at the end of this puncturing movement, by means of a pin working in the cam slot.

The coin having been deposited and closed the calling circuit, and the operator having ascertained that the desired connection can be obtained, she sends an impulse over the line, which energizes magnet H. The armature Hx is then attracted, arm H2 with the spring Mx moved to the right, so that projection m3 is out of the path of the coin, and the latter rolls along the lower chute S3 into the window; arm G′ is moved to the right, and the ratchet G′ moved down, permitting the slide D to be thrown forward to puncture the paper, thus recording the transaction, and moving the disk along ready for another operation.

If the connection cannot be obtained, or a wrong coin is deposited, the push-button P4 may be resorted to to open another little door in the side of the main chute, permitting



705,161—CONNECTING PLUG FOR ELECTRICAL SWITCHBOARDS.

the coin to come out through the passage way S2.

705,073—M. Grover, device for preventing humming of telephone wires.

This invention is in the nature of a damper to prevent the ordinary humming vibrations of telephone and telegraph lines. The device consists of a split body 7 of some material like rubber, fitted on the wire 5 or 6, and tightly secured thereto by a clamping device such as a twisted piece of wire,

8. In the case of two parallel wires, 5 and 6, the clamping wire 8 may be extended across to form a bridle, 12.

705,161—A. T. M. Thomson, connecting-plug for electrical switchboards.

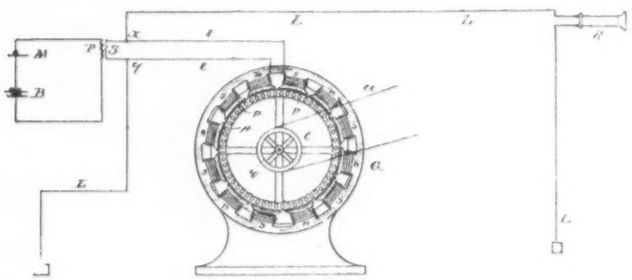
This is a switchboard plug of a well-known type, having tip, ring and sleeve contacts. The cord conductors are connected to the tip and ring. In the heel of the plug a chamber is provided, containing a miniature incandescent light covered by a bulls-eye 13. The lamp terminals are connected to the sleeve and the ring of the plug. The lamp constitutes a supervisory signal, and by locating it in the plug in this way the third conductor usually employed in the cord circuit is dispensed with.

JULY 29.

705,685—Joseph Lyons, telephony.

The application upon which this patent was granted has been pending since Sept. 2, 1899. Quite a number of years ago Mr. Lyons was an examiner in the patent office, in the electrical division, and during his years of practice since leaving the office he has handled much of what is called "heavy" work. His treatment of any subject, therefore, is such as one would expect from a man possessed of mathematical knowledge and methods, and the experience referred to.

The present invention is in the nature of an improvement upon an invention patented to Hutin and Leblanc, No. 606,762, July 5, 1898, and it consists in a method and ap-



705,685—TELEPHONY.

paratus for reinforcing telephone currents upon a line. This reinforcing is accomplished by reducing the apparent resistance of the line to these currents continuously, and practically to any desired extent. The machine employed is really a sort of "booster," but of a much more refined nature than those ordinarily employed on lighting or power circuits. In this case the telephone currents are primarily caused to produce an alternating field or fields of force varying in frequency and intensity with the frequency and intensity of the telephonic currents and within such field or fields electric circuits closed upon themselves are rotated with a speed which exceeds a certain critical speed. By this rotation within the initial magnetic fields the electromagnetic reactance of the telephone circuit is reduced, whereby the initial field or fields and the exciting currents are reinforced.

The Hutin and Leblanc patent referred to sets forth somewhat similar means for reinforcing faint alternating currents of one definite frequency, causing them to produce an alternating magnetic field or fields, and causing circuits closed upon themselves to rotate therein with a speed exceeding a determinate critical speed. These machines were suggested for use as constant potential alternating current generators, but Mr. Lyons states that they have heretofore been used only for the reinforcement, by each, of an alternating current of one definite frequency, as stated, and the speed given to the closed circuits was calculated and determined with reference to that one frequency.

The rule which governs the operation of such machines is that if the frequency of the alternating current led to the machine is designated by $\frac{1}{T}$, and if the number of poles of the field excited by these currents is designated by $2n$, then in order that the initial field and the initial current be reinforced the number of revolutions of the circuits closed upon themselves must exceed the quantity $\frac{1}{nT}$. This rule may also be stated in these words: The number of rotations of the rotor must exceed the frequency of the alternations of the alternating current that excites the stator divided by half the number of poles of the latter.

In the practice of telephony alternating currents of constantly-varying periodicities and intensities are generated, and it has been found that the currents corresponding to the highest pitch of sounds against the telephone-transmitter rarely exceed the frequency of eight hundred per second. All other frequencies that occur in practice are below eight hundred per second. In order to reinforce alternating currents of the frequency of eight hundred with a machine of the Hutin and Leblanc type, if the same has, for instance, twelve field-poles, the circuits closed upon themselves have to be rotated with a speed exceeding one hundred and thirty-three revolutions per second. If this is done, then not only the currents having the frequency of eight hundred will be reinforced, but all other currents of a lower frequency will also be reinforced. Accordingly Mr. Lyons passes the faint telephone-currents at any point on the line through the field-coils of a machine of the Hutin and Leblanc type and rotates the armature of the machine with a speed exceeding the number of periods of the highest frequency current that occurs or is likely to occur in telephony divided by half the number of poles of the field-magnet. By this process the lower frequency currents are more reinforced than the higher-frequency currents; but it is stated that this does not vitiate the reproduction of speech, but, on the contrary, improves the reproduction, since lower-frequency vibrations must be of higher amplitude than those of higher-frequency in order to produce sounds of the same intensity as the latter.

In the accompanying drawing, the figure is a diagram illustrating the invention as applied to long-distance telephony with an unbroken line.

The system here represented operates as follows: Speech uttered against the microphone M causes alternating electric currents to be generated in the secondary S of the induction coil. One branch of these currents passes through the field-coils of the reinforcing-machine by the conductors 1 1, and another branch passes to the line L L. Both current branches are exceedingly weak, and the branch passing to the line is too weak to cause an audible reproduction of sounds in the telephone-receiver R if the line exceeds a certain length; but if now the rotor of the reinforcing-machine is rotated with such speed that its number of rotations per second exceeds the number of periods of the currents due to the sound of highest pitch that is uttered against the transmitter divided by half the number of poles of the field then the initial and exceedingly weak alternating field excited by the telephone-currents is reinforced, and these currents themselves are reinforced. This reinforcement may be carried to any desired extent, depending upon the size and speed given to the reinforcing-generator and also depending upon the electromagnetic reactance of the reinforcer. This reactance should be made as small as practicable, and for this purpose the amount of iron entering into the construction of the machine should be very small, and the iron, if employed at all, should be highly laminated. It will be understood that the reinforcing-machine may be in series in the line instead of in a branch derived therefrom.

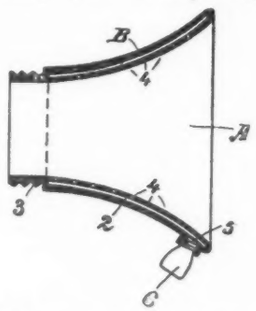
705,686—Joseph Lyons, telephony.

This is a companion case to that just referred to. Claims for the method of operation are presented in the other case, and claims for the apparatus, employed as already described, are made in this case.

AUGUST 5.

706,169—W. M. English and G. A. Burns, antiseptic telephone mouth-piece.

In this mouth-piece there are inner and outer walls, having a space 2 between them, all around. In an opening, 5, formed in the outer wall a receptacle, 6, is secured, con-



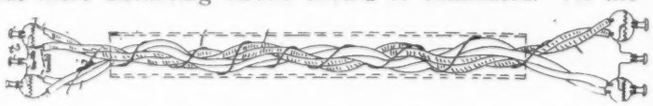
76,169—ANTISEPTIC MOUTHPIECE.

taining a volatile disinfecting agent. The inner wall is provided with a great many small openings, as shown at 4, and the butt of the mouth-piece has the usual screw-thread 3. The fumes from the receptacle, 6, pass into the chamber, 2, and thence through all the openings, 4, so as to uniformly disinfect the inner surface of the mouth-piece.

706,308—I. H. Farnham, dec'd, telephone circuit.

This patent is granted to Marcia J. Farnham as administratrix of the estate of the late Isaiah Farnham, the well known telephone engineer.

Once upon a time when telegraph lines were the only other circuits carried upon poles to transmit electrical currents, it was possible to construct telephone lines like the telegraph lines, using the ground as the return circuit. Inductive effects from the telegraphic currents were little felt, or if they were they occasioned few complaints, because the telephone was a new thing, and if a man understood two-thirds of the talk over the wire he thought he was getting his money's worth. As soon as the novelty wore off, however, and particularly after the introduction of electric light, power and railway service began, better things were required, and it became necessary to substitute metallic circuits for grounded circuits, and to transpose the conductors upon the pole lines relatively to one another; and as the same troubles occurred in cables, both overhead and underground, it became necessary to arrange their conductors so that these disturbing effects should be eliminated. As the



706,308—TELEPHONE CIRCUIT.

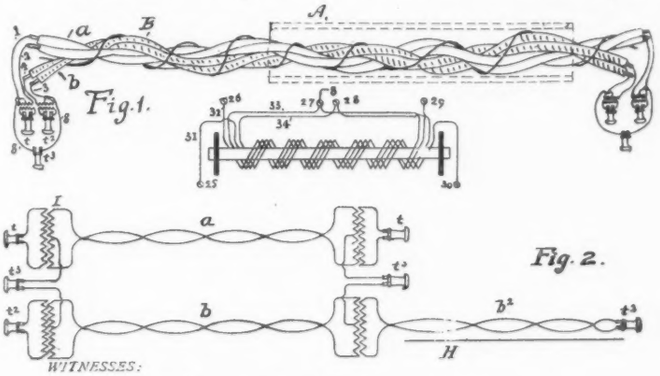
art of telephony broadened, composite circuits were devised for simultaneous telegraphic and telephonic transmission, and also for telephone service, whereby the conductors of each of two telephone circuits were employed in parallel as one limb of a third telephone circuit, this becoming known as a "phantom circuit."

In all large towns and cities the overhead pole lines and house top supports for wires have long since become obnoxious, and the circuits are being rapidly placed underground. The conductors are bundled together in insulated, twisted pairs, and enclosed in a protecting covering or sheath, usually of lead. The pairs of conductors within the sheath are arranged in reverse layers, i. e., a certain number of pairs twisted to the right to constitute one layer, over this another set of pairs twisted to the left for the second layer, and so on, such cables having been constructed frequently with two hundred pair, and sometimes more. Such cables have certain determinate electrical properties, such as resistance and electrostatic capacity, as telephone engineers have good reason to know. At the present time the conductors, of soft copper, are usually covered with dry paper insulation.

The invention set forth in the present case relates to such telephone cables, and also includes the circuits referred to, the cable being constructed with particular reference to the formation of phantom circuits which will not be noisy.

The cable consists of a plurality of pairs of insulated conductors separated from each other to as great an extent as the permissable diameter of the sheath will allow. The conductors are twisted in pairs, and each two pairs are also twisted together in a reversed direction to that of the individual conductors forming the pairs, the length of a twist or turn of each pair of conductors and also of each pair of pairs being made about three inches. Each set of two pairs when twisted is bound with a thread of distinctive color to identify the pairs, and the whole of the conductors when thus arranged in sets of pairs, are formed up into a cable in reversed layers, as before mentioned. Each double pair of twisted conductors constitutes a unit, which, when the cable is in place is adapted to form three independent circuits, i. e., the two metallic circuits and a third or phantom circuit in which each single pair is employed as one limb or conductor. In such a cable the phantom circuits are twisted pairs, as well as the individual pairs, and therefore should not be noisy.

In forming the phantom circuits referred to each pair of conductors is bridged near the end of the circuit by an



706,319—TELEPHONE CIRCUIT.

impedence coil, and the middle points of these impedence coils are connected to form the third circuit.

706,319—M. H. Howell, telephone circuit.

The invention in this case is an improvement upon that of Mr. Farnham, just described. The arrangement of the pairs of conductors in the cable is the same, but instead of employing bridged impedance coils, Mr. Howell employs repeating coils having double or balanced windings, and taps off the wire connections for his phantom circuits from the middle points of these windings. It must be apparent that where a long and a short circuit are used to form a phantom, the extension of the longer circuit is liable to destroy the balance, if exposed to inductive influences. Where repeating coils are employed, as shown in Fig. 2, a perfect balance will be maintained as regards the phantom circuit a b, even though the circuit b has an extension, b2, exposed to the influence of a power or lighting circuit H. The repeating coil constitutes a break, conductively speaking, while for telephonic transmission it maintains the efficiency of the line practically unimpaired.

In winding these repeating coils, it is necessary that each separate winding be laid on double, that is, that supposing each winding to be divided into two equal halves these two halves are wound on the core, not in sequence, but parallel and together, leaving four ends. The beginning of one half and the end of the other, such as 32 and 29, in Fig. 1, are left out for terminals; and the end of the first and the beginning of the second are connected as at 27. The reason for this construction is as follows: If

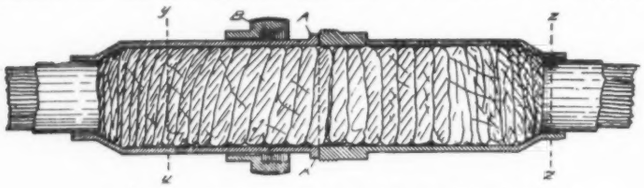
ordinary series winding, or end-on windings, be tapped off at an intermediate point and current sent through them in parallel, the total magnetic effect produced in the core is a very considerable percentage of that which would be produced if the current were passed through the windings in series. With the two halves of each winding laid on in parallel, however, as in the present case, they should almost completely neutralize. As expressed in the patent specification, both sides of the coil are balanced and are symmetrical.

In addition to this method of winding, the conductors are preferably twisted together.

AUGUST 12.

706,567—T. P. Jones, telephone cable connection.

This is a divided sleeve to slip over a joint in a telephone cable, with a ring coupling in the middle and contracted ends. Before the cable is spliced one-half of the sleeve is slipped

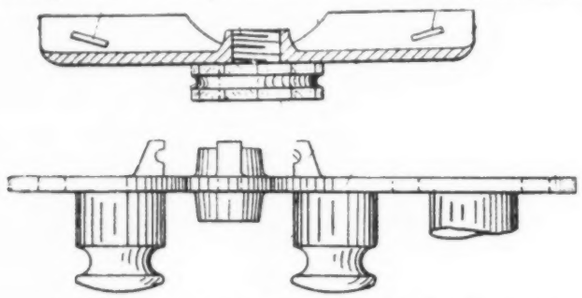


706,567—TELEPHONE CABLE CONNECTION.

on each end of the cable, and after splicing, waterproof paper or other like material is wound over the splice. The two halves of the sleeve are then pulled together and coupled at the middle by the screw threaded thimble and ring. The patentee says this makes a waterproof joint. No solder is apparently used, however.

706,786—J. W. Seamon, device for stringing electric wires.

This is a case where it takes twenty-five figures of drawing to show what the patentee has, but the description can all be condensed in a page. The gist of the invention lies in the provision of a metal base, 1, which can be attached to iron beams, brick walls, frame structures, etc., and a separate insulator carrying part, 2, which is provided with locking means to secure it to the base at various angles. The part 2 takes many and strange forms, being adapted to carry anything from a rotary cutout to a set of telephone jumper



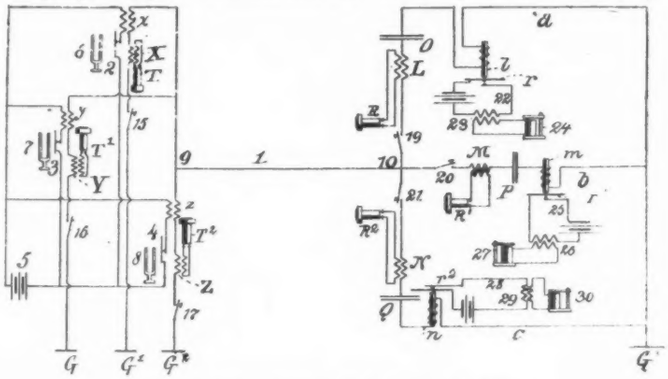
706,786—DEVICE FOR STRINGING ELECTRIC WIRES.

wires, while the base is also made somewhat distorted at times to permit its attachment to poles.

707,007—M. I. Pupin, multiple telegraphy.

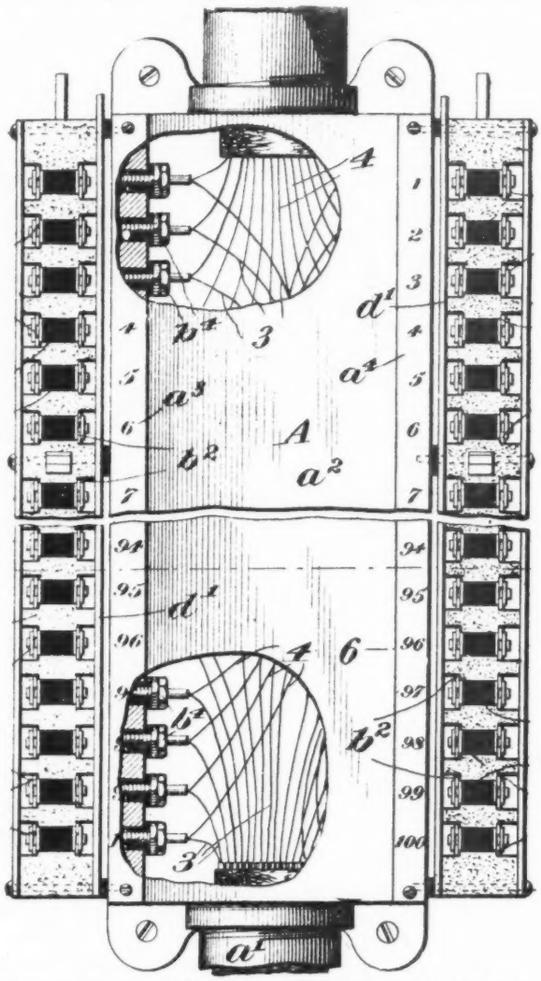
707,008—M. I. Pupin, multiple telegraphy.

These two patents are of great interest at this time. Professor Pupin has recently employed means depending upon the same principles herein set forth, to render telephony possible over greater distances than before. The press, both technical and popular, has teemed with stories of the extraordinary remuneration he received from the American Bell Telephone Company for this long distance telephone system, and the "Pupin insulator," and Pupin coils, are now well known. In the American Journal of Science for March, April and May, 1893, and November, 1894, as well as in the transactions of the American Institute of Electrical Engineers in May, 1893, Professor Pupin published accounts of his investigations into the subject of electrical resonance, and the laws underlying electrical tuning of circuits, and the analogy between these and the laws underlying acoustical tuning and resonance. In an article in the Transactions of the American Institute of Electrical Engineers, May 17, 1893, he announced his discovery of the selectivity



707,007—MULTIPLE TELEGRAPHY.

of tuned circuits or conductors, by virtue of which, if a number of periodic electromotive forces are impressed on such tuned circuits, the individual tuned conductors will resonate each to the periodic electromotive force of its own pitch. It is upon this principle that the present invention



707,049—TERMINAL BOX FOR PROTECTED ELECTRICAL CIRCUITS.

depends. While the title of the case is limited to telegraphy, the scope of the invention claimed is wide, and the claims, as they will probably be interpreted, will extend into many other fields.

In the diagram 1 is a common circuit having the three transmitting branches shown at the left, with a tuned periodic transmitting device as indicated at 6, 7 and 8, in each, of a distinguishing frequency different from the others. At the receiving end of the line, on the right, the three branches, a, b and c, have receivers for individual receiving, each being tuned by means of capacity O, P, or Q, and self-induction l, m, or n, to respond or resonate to the particular one of the three frequencies, 6, 7 or 8, which is to be used in the individual transmission.

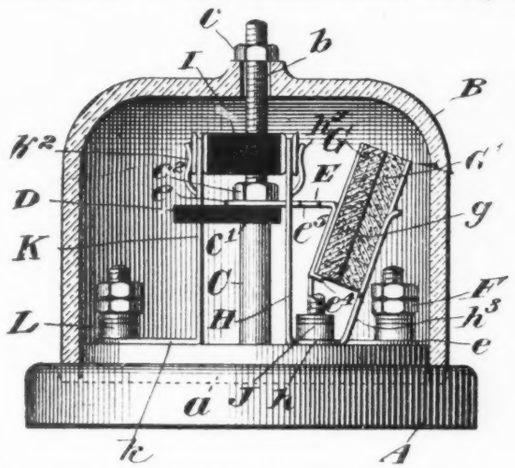
The claims are directed to covering broadly the idea of resonant selectivity. One of the patents is for the method of operating, and the other for the apparatus, as under the practice in the patent office both cannot be claimed in the same case.

707,049, F. B. Cook, terminal box for protected electrical circuits.

This is one of the divisional Cook cases referred to in a previous paragraph. The invention in the present case is the well-known type of cable head, employing the sneak current arresters already described, which are shown in the drawing herewith, arranged in banks. When a coil operates to break its circuit, it also grounds the line, and in the present case closes an annunciator circuit, by means of an additional pair of springs, so that the bank is indicated to an attendant and the broken circuit may be attended to at once. The claims are not limited to the arrangement of the protective devices alone, being also directed to the box structure and the arrangement of detachable cover, terminals extending through the sides of the box and carrying the protective devices outside, etc.

707,050, F. B. Cook, electrical protective set.

This is another division of the broad case already referred to. The invention here patented is a combination set for the subscriber's or other isolated station, having the bell



707,050—ELECTRICAL PROTECTOR SET.

glass B, covering a base A, on which are arranged the spring terminals H and K with the heat coil arrester I, the high potential or lightning arrester G, G', etc.

The Cook apparatus is so well known that detailed explanation is hardly necessary.

GERMANY WILL INVESTIGATE HERE.

A dispatch from Frankfort-on-Main states that the German Government has decided to dispatch an official commission to investigate the postal, telegraph and telephone methods and devices of the United States. The commission consists of Postal Advisers Wernicke of Leipsic and Graun of Hamburg, and Telegraph Engineer Feyerabend of Berlin. Emperor William is said to have expressed his determination to copy America in every particular that promises advancement for Germany.

MR. FRANK F. SAPP.

Mr. Frank F. Sapp, who has charge of the advertising and sales department of the North Electric Company, Cleveland, is one of the most widely known men in the Independent telephone field. He was born and raised in Illinois and is a graduate of Oberlin college. Mr. Sapp entered the newspaper field while at school and learned every part of the business. He held various editorial positions, and devoted a great deal of time to the business management of publications. His last newspaper work was in an editorial capacity on one of the Chicago dailies. In 1893 Mr. Sapp became interested in the Independent telephone movement. Prior to 1899, when he became associated with the North Electric Company, he promoted and built exchanges and represented telephone manufacturing inter-

FRANK F. SAPP.

ests. Mr. Sapp has made telephone advertising a study and his work in this line has won him encomiums from advertising experts. There is to-day no better advertised telephone manufacturing company than the North, and the credit for this is due Mr. Sapp. He is an unassuming gentleman of high attainments and one of the most popular men in the field.

TELEPHONING TELEGRAMS.

It is stated that the National Telephone Company of London has made arrangements with the Postmaster-General by which telegrams are accepted from the company's subscribers, not only at the post office directly connected with the exchange to which the company's subscribers themselves are connected, but also, when that office is closed, at any post office open that may be most readily available to the subscriber.

Telephony.

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AMERICAN BELL OUTPUT.

In the instrument report of the American Telephone and Telegraph Company for the month ending July 20, it is shown that the parent Bell company's net output of instruments for the month was less than the output in any corresponding month in four years, while the number of instruments returned was greater than for any corresponding month in four years. To the close student of the telephone business this report is most interesting, and shows that the American Telephone and Telegraph Company returned instruments for the month in excess by nearly ten thousand, of the number put in service. Since 1900 the number of instruments returned has exceeded the number put in service. If this ratio continues the Bell company will be compelled to resort to something more than free service to keep the number of outstanding instruments intact. When the present activity in the telephone field is considered, it seems remarkable that the so-called monopoly should make so poor a statement. The report is given herewith to show that not alone in this respect but in many others the once powerful Bell company is losing ground. The report follows:

Month ending July 20:

	1902.	1901.	1900.	1899.
Gross output ..	59,935	56,526	65,463	48,873
Returned	34,054	30,241	30,093	18,028
Net output	25,881	26,285	35,370	30,845
December 21 to July 20:				
Gross output ..	649,044	526,449	411,609	389,899
Returned	260,321	224,810	162,753	109,765
Net output	388,723	301,639	248,856	280,134
Outstanding, July 20.....	2,914,735	2,254,455	1,829,361	1,405,384

It will be observed that in July, 1899, the net output exceeded the number returned by over twelve thousand. In July, 1900, the output exceeded the returned by over fifteen thousand. In July, 1901, the returned exceeded the output by four thousand, and in July, 1902, the returned exceeded the output by nearly nine thousand. If the parent company is putting out a less number of instruments each year and having a greater number returned each year it would seem that the Independents have the upper hand in the fight for better and cheaper telephone service. It will be well to watch the succeeding reports of the American Telephone and Telegraph Company, and unless all signs fail the showing will be less attractive each month to the company's stockholders.

EQUITY IN MEASURED-SERVICE RATES.

An unlimited service flat rate in public-service functions is abnormal, inequitable and unjust. Railroads and street railway companies charge a stipulated price for each ride; gas companies for each thousand feet of gas; water companies for each gallon of water; electric light companies for each kilo-watt hour of current; the telegraph companies for each telegram; the express companies for each package, because experience has shown that to charge otherwise would be inequitable and unsatisfactory to the customer and unprofitable to the company.

Then why should Independent telephone companies cling to the obsolete and costly method of supplying unlimited service for a flat rate annual charge? The Bell companies are educating the small user to perceive the injustice in making the subscriber who uses the service but once or twice a day to pay the same flat rate as the subscriber whose telephone is constantly busy; and are leading the large user to understand that he is obtaining his unlimited service below the cost of delivery, and that present flat rates must be materially increased to yield a profitable revenue to the company just as often as there is a material increase in the

number of subscribers accessible to the large user of unlimited service. If each subscriber paid only for the service actually used one would probably pay somewhat less and the other far more than at present; but the gross income of the company would probably be increased, and the cost of operation slightly reduced. For the greater the number of subscribers connected to a telephone system the greater the number of calls per subscriber; thus the greater the number of operators required, the greater the facilities necessary to handle this increased traffic, and, hence, the greater the relative expense incurd by the company in supplying service.

On a measured service basis the small user pays more per call for the few calls he makes than the large user pays per call for the many calls he sends in, just as the large consumer of water or of gas or of electric light or power pays less per unit than the small consumer. And this is admittedly only just and equitble. For the telephone company must maintain at all hours of the day or night just as complete, as comprehensive and as expensive an organization for the man who makes one call a day as for the man who makes more than a hundred calls each day.

It is claimed that a stipulated price of so many cents per call should be charged all users of the service for each call regardless of the number of calls sent in, just as the postoffice charges 2 cents for each letter. But these claimants forget that this postal rate of 2 cents is inequitable and only tolerated because it is a losing rate and the taxpayer makes good the deficit. A truly American plan would be to have a sliding scale of postal rates. For the postal authorities are compelled to maintain intact their combined organization in in all its magnitude for the man who sends but one letter a month, and thus contributes 24 cents per annum to the income of the postffice department, as it does for the man who sends a thousand letters a day and contributes $24,000 a year towards maintaining the mail service of our country.

In other words, on a flat rate basis the addition of many small users to a telephone system make it possible by the infrequency of their calls for the large users to secure telephone service at an extremely low rate per call, often for a small fraction of a cent per call, while the cost per call to the small user amounts to several cents by reason of seldom calling. Thus the small user of telephone service indirectly helps to pay for the comprehensive service received by the larger user.

But in the postoffice the case is reversed. For only by reason of the enormous number of letters sent out by the larger users is it possible for the occasional correspondent to utilize so comprehensive a service for the small charge of 2 cents. And if 2 cents is a fair price to charge for carryone letter once a year say a distance of 3,000 miles across the continent, why should the man who sends a hundred thousand letters a year be compelled to pay 2 cents each, though the greater number of these letters travel less than 300 miles?

THE CASTELLI RECEIVER.

In this issue of TELEPHONY will be found some notes by Mr. H. W. Sullivan upon the Castelli tube, or microphonic receivers for wireless telephony. These notes are taken from the London Electrical Review, which publication, in speaking editorially of the new receiver, says:

"This instrument is a radical departure, which seems likely to have far-reaching results in aerology. Curiously enough, but for a recent controversy in a lay journal, we might not have heard for some time to come of the new apparatus and the important results obtained with it, although the admission of Messrs. Marconi & Co. that in their fascinating trans-Atlantic experiment of last winter they had employed a telephone as the receiving instrument in Newfoundland first excited inquiry as to the particular type of receiver with which the telephone was joined up, when the now historic S'S'S . . . in the Morse code alphabet were transmitted from Cornwall, whether through the medium of the æther or the earth. As regards the susceptibility to atmospheric disturbances of the present filings coherers, the paper read by Captain H. B. Jackson, R.N., F.R.S., before the Royal Society in May last, and now just published, "On Some Phenomena affecting the Transmission of Electric Waves Over the Surface of the Sea and Earth," throws waves of light upon the serious interference with signalling which is experienced from this cause, even in the Mediterranean. Captain Jackson's paper, which teems with practical information and suggestive ideas, is the more valuable because he was the earliest naval wireless and independent worker in what is now termed wireless telegraphy. It must be satisfactory to know that as our own navy was the first to independently and officially recognize the advantages on warships of wireless signalling, so since then has it maintained its lead in this new field. We must heartily congratulate the Italian navy and Semaphorist Castelli upon the practical success of his brilliant and original idea. Speaking of the Castelli invention, the Pall Mall Gazette of the 10th inst. says: 'One interesting feature of the case is that this beautifully sensitive instrument is unpatented, and can be employed by anyone who chooses to rival Signor Marconi in his efforts to annihilate space.'"

THE TELEPHONE AND TELEGRAPH.

The Boston News Bureau in a recent issue in discussing the relations of telephony and telegraphy has some interesting things to say in reference to the telephone superseding the telegraph:

"Formerly between two cities in Massachusetts 40 wires were humming with Western Union messages; to-day 40 telephone wires are doing the business, and two telegraph wires could take care of all the telegraph messages between those two cities and yet the Postal company is there dividing what little telegraph business there is left. The Western Union compared with the telephone system is a stage coach in comparison with the railroad.

"A few years hence the American Telephone and Telegraph Company will be in a position to do what little telegraph business is required in this country at a minimum cost as a mere incident of the telephone business. At present the Telephone company is having its hands full with the construction of new lines to meet the demands of its enormously expanding business.

"Nearly one-half the population of the United States is in cities, and this means that in the future more than one-half the people of the United States will be within easy reach of the telephone, and this one-half will be the active half of the population, and the people who use the telegraph will be a decreasing number.

"The Western Union company is laden with such leases and water-soaked capital as to make impossible to consider an enlargement of itself into the telephone field while the Bell Telephone system of the country is doubling and quadrupling all the telegraph lines. The Telephone company has not only a telephone system paying expenses and a fair interest upon the construction cost, but it has a telegraph system at absolutely no cost, and which is now unused, for you can telephone and telegraph on the same lines at the same time without interference. It has, furthermore, the great necessary adjunct of the telegraph service—a messenger system, for the collection of dispatches, and this messenger system is its 1,500,000 telephone stations in the United States."

I consider TELEPHONY one of the best telephone papers published and would not be without it.

H. J. BOLLIN,

New York State Association Organized.

On July 25th representatives from a majority of the telephone exchanges of New York state convened at Rochester for the purpose of organization, the objects sought, according to the call, being as follows:

The exchange of views regarding the methods and forms of operating.

The standardizing and uniformity of equipment and construction.

The adjustment of any possible differences regarding territorial rights, etc.

A united effort to assist in speedily connecting all exchanges of the state with toll lines.

To give information and advice to individuals or companies contemplating the building of new exchanges.

To generally keep in touch with the new and rapid progress that is being made in Independent telephony.

The giving of moral and financial support in cases of litigation that might affect the interests of all members of the association, etc.

Owing to a radical difference of opinion on the part of two conflicting factions in the selection of a temporary chairman, a portion of the delegates withdrew to the Powers' House, the original meeting at the court house continuing.

COURT HOUSE MEETING.

The meeting over which Mr. Carey presided elected the following permanent officers: President, Martin Carey, Buffalo; vice-president, C. E. Stinson, Rochester; secretary, Charles H. Blood, Ithaca, and treasurer, F. E. Lyford.

Executive Committee—President Martin Carey and Secretary Charles H. Blood, ex-officio; C. E. Stinson, George N. Orkett, Hornellsville; T. S. Lane, Jamestown, and Burt G. Hubbell, Buffalo.

"The New York State Independent Telephone Association" was adopted as the name of the organization, and, acting under instructions from the meeting, the officers and executive committee filed articles of incorporation with the county clerk at Rochester. In these articles the objects of the association were set forth to be, among other things:

To promote the interests and welfare of the Independent telephone business; to collect and diffuse accurate and reliable information in regard to Independent telephone companies; to secure freedom in said business from unjust and unlawful exactions; to settle differences between its members and to promote a more large and friendly intercourse between the men engaged in the Independent telephone business.

The directors were named as follows: Martin Carey, Burt G. Hubbell, Walter P. Cooke, M. F. Dirnberger and Francis M. R. Taylor, all of Buffalo.

The companies represented in the meeting that elected Mr. Carey as president were:

Dundee, Lakemount & Starkey Telephone system; Keith & Sons Independent Telephone system, Cattaraugus; Home Telephone Company, Jamestown; Genesee Company; Himrod Company; Watkins Telephone Company, Keuka Park, Branchport & Pulteney Company; West Ellery Telephone Company; Salamanca Telephone and Telegraph Company; Frontier Company, Buffalo; Crosby & Barrington Telephone Company; Valley Telephone Company, Waverly; Wyoming & Cattaraugus Telephone Company; Panama Co-operative Telephone Association; Warren Telephone and Telegraph Company; Union Telephone and Telegraph Company; Farm and Village Telephone Company, North Lansing; Madison and Onondaga Telephone and Telegraph Company; Kiantone Co-operative Telephone Association; Hornellsville Company; Haines Telephone Company, Buffalo; Consolidated Telephone Company, Buffalo; Inter-Ocean Company, Buffalo; Independent Company, East Randolph; Dansville Company; Canisteo Valley Telephone Company; Geneva Company; Oakhill Telephone Company; Buena Vista Telephone Company; Southern Tier Telephone Company; Howard & Buena Vista Telephone Company; Honey Run and Hartsville Hill Company; Oregon and Cameron Telephone Company; Dickey Telephone Company and Stewart Telephone Company; Allegany Mutual; Greenwood Telephone Company; Jasper and Canisteo Telephone Company; Albany Home Company; Penn Yan Company; Ithaca Telephone Company; Prattsburg Company; Bath Telephone Company; Corning Company; Almond Mutual Company; Portland Telephone Company; Madison and Onondaga Telephone and Telegraph Company; Atlantic Company, New York City; Canisteo Telephone Company; Frewsburg Co-operative Company.

POWERS HOUSE MEETING.

The meeting at the Powers House was called to order by Mr. George R. Fuller of the Rochester Telephone Company and the following permanent officers were elected:

President, George R. Fuller of Rochester; Howard Hendrickson, Albany, for first vice-president; Boyd McDowell, Elmira, for second vice-president; Charles O. Harris, Rochester, for secretary and treasurer.

Executive Committee—S. B. Rawson, Lockport; J. S. G. Edwards, Gloversville; James S. Brailey, Jr., Utica; Edward Davis, Troy; F. M. Potter, Jr., Syracuse; C. D. Vernoy, Cortland; W. D. Barnard, Saratoga, and E. L. Barber, Rome.

The meeting also adopted the name of "The New York Independent Telephone Association," and the officers filed articles of incorporation with the county clerk, which set forth the objects of the association as follows:

1st.—The protection of all Independent telephone interests of common concern to the members of the association within the state of New York. 2. The standardizing as far as possible of the equipment and construction of a telephone system in order that an early and efficient communication by telephone may be had to all points within the state. 3. The establishment and maintenance of a bureau of information for the instruction, information and benefit of members of the association.

2d.—The name of the proposed corporation shall be: "New York State Independent Telephone Association."

3d.—The territory in which its operations are to be principally conducted shall be the state of New York.

4th.—The town, village or city in which its principal office is to be located cannot now be determined, and it is not practicable to fix such location.

Directors were elected as follows: Samuel B. Rawson, Elyria, Ohio; J. S. G. Edwards, Johnstown, N. Y.; George R. Fuller, Rochester; C. D. Vernoy, Cortland, N. Y.; Edward Davis, Philadelphia; W. D. Barnard, Philadelphia; F. M. Potter, Jr., Syracuse, N. Y.; E. L. Barber, Wauseon, Ohio, and James S. Brailey, Jr., Toledo, Ohio.

The following resolutions were unanimously adopted:

New York State Independent Telephone Association, in convention assembled at Rochester, N. Y., on July 25, 1902, hereby adopt the following address to the different Independent state telephone associations in the United States:

Whereas, Almost all the states have Independent telephone associations made up of the Independent telephone companies in their respective states; and

Whereas, It is the sense of this association that the various state associations should meet together in convention some time during the fall of 1902, and form a plan for co-operation or united action among the state associations; therefore, be it

Resolved, First: That this association hereby extend an invitation to the other state associations to elect delegates from this and other associations at a convention called by the presidents of the state associations approving this action.

Second: That the various state associations at meetings which they may hold, shall elect delegates to such convention and empower said delegates to act for their respective associations.

Third: That this association shall elect four delegates at large and one additional delegate for each three thousand (3,000) telephones and one for every thousand miles of metallic circuit toll line, to represent the New York State Independent Telephone Association at said meeting or convention, and that the other state associations joining in said convention elect delegates on the same basis of representation.

Fourth: That this association is not taking this step as being against the interests of any other telephone association heretofore formed, but for the purpose of bringing the different state associations together and then to take such steps as may be deemed best for the interest of the associations represented by the delegates at such meeting.

W. D. Barnard, Binghamton; Jas. S. Brailey, Utica; F. M. Brush, Schenectady; J. R. Smith, Tonawanda, and C. E. Stinson, Rochester, were appointed a special committee to draft a constitution and by-laws, which, after considerable discussion and amendment, was unanimously adopted as follows:

CONSTITUTION OF NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION.

ARTICLE I.—NAME.

The name of this association shall be "New York State Independent Telephone Association."

ARTICLE II.—OBJECTS.

The objects of this association are as follows:

Section 1. The protection of all Independent telephone interests of common concern to the members of the association.

Sec. 2. The standardizing, as far as possible, of the equipment and construction of telephone systems, in order that an early and efficient communication by telephone may be had to all points within the state.

Sec. 3. The establishment and maintenance of a bureau of information for the instruction, information and benefit of the members of the association.

ARTICLE III.—MEMBERSHIP.

Section 1. Any person, partnership or corporation owning, constructing or operating within the state of New York an Independent exchange having twenty-five subscribers or more, or a toll line of twenty-five miles of toll circuit or more, may become a member of this association by making application in writing (on blanks to be furnished by the association) to the executive committee, and upon being approved by that committee shall become members thereof and thereupon shall pay to the treasurer an initiation fee of five dollars ($5), and thereafter shall pay the annual dues prescribed by this constitution.

Sec. 2. The annual membership dues shall be as follows: For the first one hundred (100) main line telephones or less, $2; for each additional one hundred (100) main line telephones or fractional part thereof, $1. For the first twenty-five (25) miles of toll line or fractional part thereof over which paid messages are transmitted, $2; for each additional twenty-five (25) miles of toll line or fractional part thereof, $1, and the further and additional payment from time to time of such assessments as the executive committee may levy to meet and defray extraordinary expenses, not to exceed in any one year a total of 5 cents for each main line telephone in use and 5 cents for each mile of toll line in use over which paid messages are transmitted. The first dues shall be payable on or before September 1, 1902, and thereafter all dues shall be due and payable on April 1st of each year. Special assessments shall be due and payable ten days after being levied. Exchanges and toll lines under construction, the number of contracts and miles of erected poles shall be the basis of computation.

Sec. 3. Each member of the association shall, when requested by the secretary, give such information as may be required by the association for the purposes of determining the amount of assessment, and all other information that will be of advantage to its members; and during the month of January each member shall make a report, signed by the president and secretary of the company, under the seal of the company, upon blanks furnished by the secretary of the association, stating the number of telephones in actual operation and the number of miles of toll line in actual operation January 1st. Unincorporated members shall make such report under the head of its executive officer or partner.

Sec. 4. If any member shall fail to pay his annual dues during a period of three (3) months following the annual meeting, and after notice from the secretary, he shall still fail to pay the same, for a further period of thirty (30) days thereafter, such member shall be stricken from the membership list of the association.

ARTICLE IV.—MEETINGS.

Section 1. The association shall meet annually on the first Wednesday after the first Monday in May of each year, at such time and place as may be determined by the executive committee. Notice thereof shall be given to each member by mailing a copy of the call at least thirty (30) days prior to the date of such meeting.

Sec. 2. The president shall call a special meeting of the association upon request of the executive committee or upon request in writing of a majority of the members of the association in good standing. Ten days' notice of such special meeting shall be given in the same manner as provided for annual meetings.

Sec. 3. Fifteen properly authorized delegates present at any meeting shall constitute a quorum for the transaction of business of this association.

ARTICLE V.—OFFICERS, THEIR POWER.

Section 1. The officers of this association shall be: A president, first and second vice-presidents, secretary and treasurer and an executive committee to consist of nine members, one of whom shall be the president, and two inspectors of election. The office of secretary and treasurer may be held by the same person.

Sec. 2. The officers herein provided for shall be elected by ballot at the first meeting of the organization of this association and annually thereafter by ballot at the annual meeting of the association, and shall hold their respective offices until their successors are elected and qualified.

Sec. 3. The president shall preside at all meetings of the association and generally do and perform all the acts and duties usually done and performed by presidents of similar organizations. He shall appoint all committees other than executive committee, and shall countersign all checks drawn by the treasurer.

Sec. 4. The vice-presidents shall in their order perform the duties of the president in his absence or his inability to act.

Sec. 5. The secretary shall keep the minutes of the association and shall collect all moneys and receipt for same and turn the same over to the treasurer. He shall keep an accurate account of all receipts and disbursements of money and shall make a report at the annual meeting of the association and to the executive committee whenever called upon so to do; and he shall, under the direction of the executive committee, conduct a bureau of information for the benefit of the members

of this association, collecting data and information relating to the welfare and promotion of this Independent Telephone Association. The secretary shall send out all notices of annual and special meetings and the meetings of the executive committee. He shall attend all meetings of the executive committee and keep proper records of the same, but shall not vote or take any part in their proceedings. He shall receive such compensation as may be fixed and determined by the executive committee.

Sec. 6. The treasurer shall have the care and custody of the funds of this association, and shall deposit the same in such bank or banks as may be designated by the executive committee.

All drafts shall be drawn by the treasurer and countersigned by the president.

The secretary and treasurer each shall give a bond, the penal sum to be fixed by the executive committee.

The inspectors of election shall perform the duties properly pertaining to their office.

ARTICLE VI.—EXECUTIVE COMMITTEE QUORUM.

Section 1. The majority of the members of the executive committee shall constitute a quorum for the transaction of business. Ten days' notice of meetings shall be given by mail at the last known address of each member of the committee.

Sec. 2. The executive committee shall have such powers, duties and authority as may be committed to or vested in it at any meeting of the association, and between the meetings of the association shall have full power and authority to transact any and all the business of the association.

ARTICLE VII.—VOTES.

Section 1. Upon the consideration of any business had at any annual or special meeting of the association, the delegates present at such meeting shall be entitled to one vote for each one hundred (100) telephones or fractional part thereof and in actual operation, and each twenty-five (25) miles of toll circuit or fractional part thereof—the right to vote (excepting at the organization meeting) to be determined by the last report on file in the secretary's office of the number of telephones and the miles of toll circuit reported and accepted; providing, however, that no member shall be entitled to vote when any dues or assessments shall remain unpaid. Exchanges and toll lines under construction, the number of contracts and miles of erected poles shall be the basis of computation.

Each member of this association shall be represented by one delegate.

In case of an incorporated company, such delegate shall be a stockholder of the member, and in cases of unincorporated companies shall be some person financially interested in the affairs of such member.

Each delegate shall present proper credentials upon blanks furnished by the association.

ARTICLE VIII.

Section 1. The association may elect from its members one or more delegates to any national association of Independent telephone systems.

In the event of a failure to elect delegates the executive committee may appoint such delegates.

ARTICLE IX.—AMENDMENTS.

This constitution may be amended by a vote of three-fourths of the members present at any annual meeting of the association and at any special meeting duly called for that purpose, the object having been stated in the call.

As reported the companies represented at the Powers House meeting and their delegates were as follows:

Albany Home Telephone Company, Albany; Homer H. Hendrickson, Equitable Telephone Exchange, Arcade; O. T. Wilson, Batavia Home Telephone Company, Batavia; S. B. Rawson. Binghamton Telephone Company, Binghamton; W. D. Barnard. Black River Telephone Company, Boonesville; J. J. Domser. Black River Telephone Company, Constableville, Castorlands, Copenhagen, Lyons Falls, Lowville; T. B. Brasselin. Canandaigua Telephone Company, Canandaigua; C. E. Stinson. People's Telephone Company, Naples, Holcomb, Fishers, Vincent, Victor; H. W. Blake. Wayne County Telegraph and Telephone Company, Clyde; C. A. Lux. Home Telephone Company, Cohoes, Waterford; C. H. Williams, Cortland Home Telephone Company, Cortland, Homer, McGraw; C. D. Vernoy. Tioughuioga Telephone Company, Cortland; H. L. Smith. Syracuse Telephone Company, Chittenango; Columbia Long Distance Telephone Company, East Syracuse; F. M. Potter, Jr. Rensselaer Telephone Company, Troy, Lansingburg; New Union Telephone Company, Glens Falls, Sandy Hill, Ft. Edward; Saratoga Telephone Company, Saratoga, Ballston; Edward Davis. Ontario Telephone Company, Oswego; R. A. Downey. Utica Home Telephone Company, Utica; E. H. Ferris. Home Telephone Company, Rome; Daniel M. Hall. Friendship Home Telephone Company, Friendship; H. A. Corbin. New Berlin Telephone Company, New Berlin; E. A. Smith. Union Telephone Company, Sidney; A. N. Siver. Independent Exchange, Manchester; Mr. Osgood. Skaneateles Telephone Company; H. L. Smith. Herkimer Home Telephone Company; J. S. Brailey. Ilion Telephone Company; E. L. Barber. Warsaw Home Telephone Company, Warsaw; J. H. Griswold. Rochester Telephone Company; George R. Fuller. Dunkirk Home Telephone Company; Elmira Telephone Company; B. McDonald. County Telephone Company, Horseheads, Frankford; James Fagan. Fredonia Telephone Company; S. B. Ransom. Baldwinsville Telephone Company; Fulton Telephone Company; People's Telephone Company, Watertown; Oswego Falls Telephone Company; J. K. Whitlake. Glen Telephone Company, Johnstown, Gloversville, Glen, Fultonville; J. S. G. Edwards. Great Northwestern Telephone Company, Carthage, Grosveneur; G. E. Milligan. Standard Home Telephone Company, Kingston; J. E. Klock. Interstate Telephone Company, Little Falls; Eugene Walrath. Home Telephone Company, Lockport; W. T. Ransom. Home Telephone Company, Medina; S. B. Ransom. Mendon Center Telephone Company, Mendon Center; E. H. White. Newark Telephone Company; W. H. Kelley. Home Telephone Company, Niagara Falls; W. R. Campbell. Home Telephone Company, Tonawanda; A. R. Smith. Home Telephone Company, Poughkeepsie; F. H. Griswold. Home Telephone Company, Schenectady; F. M. Bush. Seneca Falls Telephone Company, Seneca Falls; W. Folette. Perry Telephone Company, Perry; C. M. Smith. Southern New York Toll Line Company, Albany; J. H. Griswold.

After the adjournment of the two meetings the more sober second judgment of the leading spirits recognized the fallacy of factional strife and efforts on both sides were apparent in the interests of harmony.

THE TELEPHONE GREEN BOOK.

H. H. Robinson, assistant general manager of the United States Telephone Company, Cleveland, Ohio, is compiling what is to be known as the Telephone Green Book. This book will contain a complete directory of the Independent telephone companies in Ohio, Indiana and Michigan, together with useful statistics and three special papers, setting forth the history and describing the Independent conditions in those states, written, respectively, by J. B. Hoge of Cleveland, S. P. Sheerin of Indianapolis, and J. B. Ware of Detroit. Over 1,200 copies have been subscribed for, and it is the intention of the publisher, the Telephone Green Book Publishing Company of Cleveland, to get out the work each year if the demand is sufficiently great.

THE CASTELLI RECEIVER FOR WIRELESS TELEPHONY.

The editor of l'Elettricista has performed a valuable service in calling attention to the recently proved merits of the new Castelli tube v. the ordinary filings coherer for wireless telephonic communication. Two forms of the Castelli tube, and the exceedingly simple manner of its connection, are shown in figs. 1, 2 and 3, which are in themselves explanatory.

The best size of mercury globules is from 1.5 to 3 mm. in diameter, and that of the glass tube generally used 3 mm. in internal diameter, and from 5 to 8 mm. in external diameter.

It will be noted that the Castelli tube is in effect a new

FIG. 1.

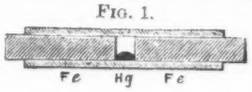


FIG. 2.

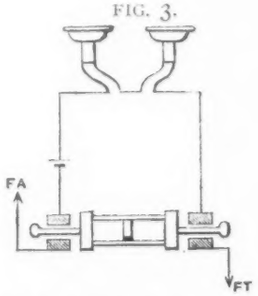
form of microphone joined up in place of a coherer in circuit with a battery and telephone; the received waves causing corresponding variation in the battery current flowing through the telephone circuit, thus producing signals.

That which impresses one in this receiver is its combined originality and simplicity. Hitherto, inventors generally have followed upon the lines of the Branly-Lodge principle of coherer, and Mr. Marconi, notably amongst others, has improved that apparatus, and by minute attention to points of electrical detail has made of it a commercial article. But the Castelli instrument is a new departure, and would seem to possess certain advantages over, at any rate, filings coherers.

In addition to its simplicity, it is self-restoring, and thus requires no tapper or other mechanical device to decohere it after each signal. This greatly increases the signalling speed. Again, a vacuum may be dispensed with, so that it is not necessary to exhaust the tube. Then, again, it is said that in case of need the operator himself can clean and efficiently re-charge the tubes—an enormous advantage in practice.

The particulars as yet published scarcely allow of an opinion being formed as to the life of the new receiver or

FIG. 3.



F. A. AERIAL WIRE; F. T. EARTH WIRE.

as to its behavior in practical working from day to day in all weathers, and especially in magnetic storms.

In a recent article upon wireless telegraphy the writer gave instances within his own observation of the considerable interference experienced in wireless signalling with the state of the atmosphere.

It was also pointed out that the signalling range can be extended within limits by using more and more sensitive coherers, but that, as the sensibility of the coherer is augmented, so also is its susceptibility to atmospheric disturbances. The filings coherer is infinitely more responsive to these disturbances than the most delicate receiving instruments at present used in land or sea telegraphy. Herein, rather than in point of perfect syntony or tuning, with its many problems, would seem to lie the difficulty in the way of establishing a service of aerial communication between continents or across great spans of land or ocean. It is natural to suppose that, owing to its extreme sensibility, the working of the Castelli tube would be even more interfered with by atmospheric disturbances than that of the ordinary and, presumably, less sensitive granular coherer. This, however, remains to be seen. It may possibly prove less responsive to the state of the atmosphere than the original Varley lightning arrester with filings, and its child, the aforesaid coherer.

Without doubt the new instrument is a departure of distinct promise in the development and perfection of wireless telegraphy, in which field so much remains to be done before it can become a practical science capable of competing with orthodox telegraphy.

The shortcomings of the filings coherer are now recognized. It has other drawbacks. Simple as appears to be the construction of this instrument, and much as has been written upon the subject of rendering it precise and constant in its operation, it is exceedingly difficult to make a coherer which will be reliable under all conditions of service. Even when, after endless work and vexatious failures, a reliable type has been finally evolved, it will fail to some extent to respond to signals at long ranges, and there is no certainty that the instrument will maintain its efficiency for the lengthened periods naturally expected of, and common to, other highly delicate apparatus.

In certain cases its very journey to its destination has apparently sufficed to effect some subtle and unfortunate change in its comportment when subjected to actual trial.

Then again, the existing plans of mechanically decohering or restoring the coherer to its normal non-conducting condition after each signal have, of necessity, the effect of limiting the speed of reception, and are more or less crude.

On consideration, it is evident that the troubles experienced with metal filings coherers are fundamental troubles due alone to the principle of their construction, and hence it is that any new and self-recovering receiver is of interest.

The disadvantage of the Castelli tube is that at present its signals can be received only on a telephone, inasmuch as in contradistinction to the granular coherer, this microphonic receiver is incapable of closing a local circuit in which is placed a Morse inker or recording instrument.

According to Prof. Banti, the maximum distance at which wireless telegraphic communication has been established in the Italian navy is 70 kilometres, while with the Castelli tube telephonic messages have been exchanged at ranges up to 200 kilometers, and the speed and certainty of signalling were also much improved. The professor quotes from official and recent experiments conducted by Italian naval officers, the results of which were published this year by permission of the ministry of marine.

These results are not remarkable as against the achievements of our own navy, which was the first of all to officially recognize the capabilities of wireless telegraphy with instruments of its own construction, and in which, prior to the deeply interesting Italian experiments as now published, wireless telegraphic messages had been exchanged and recorded on Morse at distances exceeding even the limit of the telephonic communication above mentioned.—H. W. Sullivan in the London Electrical Review.

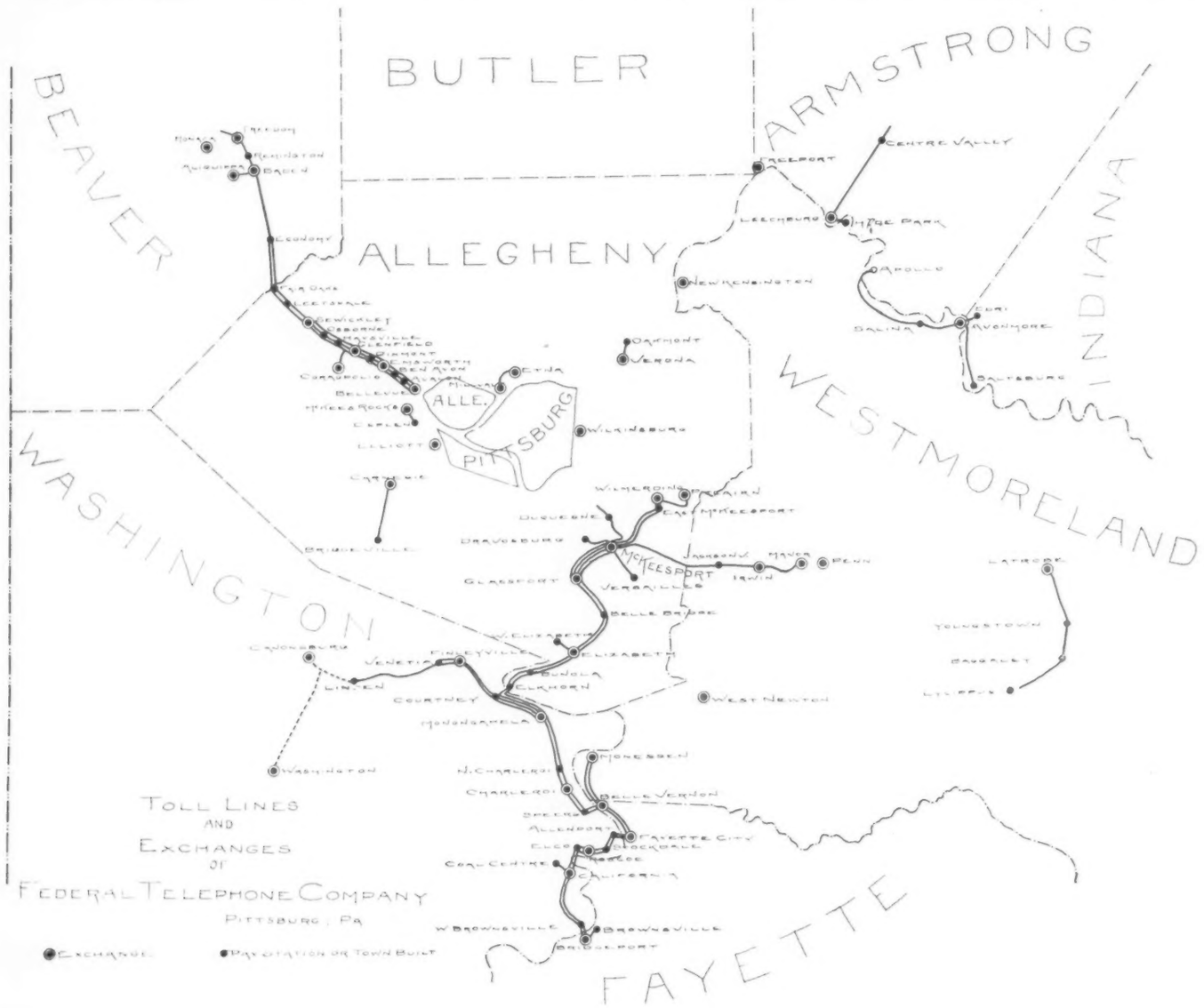
A novel telephone patent has recently been granted to Edwin W. Smith of Canada for a telephone cabinet or hood designed to take the place of the regulation silence booth in stations where space is extremely limited. It consists of a sort of diver's helmet of wood, which is attached to the telephone and into which the user of the latter puts his head while he is talking.

Federal Lines and Exchanges in Pennsylvania.

BY FRED DE LAND.

The territory in western Pennsylvania covered by the toll lines and exchanges of the Federal Telephone Company of Pittsburg, is peculiar in geographical and topographical features and thus compels the telephone engineer to face more difficult engineering problems than are found in other territory of similar size and importance. For there are four wide rivers to cross; there are many crooked, winding roads where every other pole must be guyed or anchored or the line built across private right of ways; high hills, bluffs and valleys are frequent, and many hills are heavily timbered; in some of the older towns the streets are irregular and narrow; and many streets and highways are underlaid with rocks or shale. Then the high-handed methods of the oil and gas companies in forcing pipe lines through private property did not tend to smooth the pathway of the telephone engineer when planning his toll lines. Thus it is not to be wondered that the engineer who had constructed lines along and over the straight, smooth western roads and on the broad streets of towns in the middle states feels that he doubly earned every dollar paid.

While about one-half the towns in this section have been incorporated within the last fifteen years, and thus may be called modern, the entire territory has been in process of settlement for more than one hundred years, nearly a dozen towns have celebrated a centennial, and thus streets and roads were laid out under conditions not approved by modern municipal engineers. Naturally every county is rich in historical interest, and the name of every town, road and river crossing blends in tales of adventure, heroism, savage brutality or modern enterprise. Washington and Cannonsburg were seats of learning a century ago. Brownsville was famous when the National road, "the only highway of its kind ever wholly constructed by the government of the United States," was in its glory. West Brownsville was the birthplace of the lamented statesman James G. Blaine, and was settled by his grandfather in 1784; the beginning of Monongahela City dates back to 1792, when the ferryman and storekeeper, Joseph Parkinson, divided his farm into town lots and called the town Williamstown in honor of his son William and so it remained until 1837. What is



MAP OF FEDERAL LINES AND EXCHANGES IN PENNSYLVANIA.

now known as Belle Vernon was settled by Henry Speers in 1771 and town lots sold in 1812. The borough of Speers, opposite Belle Vernon, occupies the site of a farm owned by a son of Henry Speers, and who ran a ferry across the Monongahela in 1784. Elizabeth, or Elizabethtown, as originally called in honor of the wife of Colonel Stephen Bayard, was laid out as a town in 1784, and during the next twenty-four years many vessels and steamers were built there. What is now McKeesport was in 1750-53 Queen Aliquippa's village. In 1769 David McKee secured a charter to operate a ferry, and for twenty-five years it was known as McKee's Ferry. There David's son, John McKee, laid out a town, sold 180 lots on March 26, 1795, in November named the new town McKee's Port in honor of his father, and for a time it appeared to rival Pittsburg in growth and enterprise. The country between Braddock and McKeesport is memorable as the scene of Braddock's defeat in July, 1755, and two miles north of Penn is the field where Colonel Henry Boquet defeated the savages on August 6, 1758, and reopened the western trail. Many other places are rich in historical reminiscences, but the few given will suffice to show how old this section is. Now for present conditions and the steps leading there to.

In 1897 the Atkinsons projected a Home telephone company in Pittsburg that later on went the way of all projects based on similar lines. While this plant was under construction some New York capitalists perceived that to make this home plant of value to telephone users in Pittsburg, a comprehensive country service would have to be given, as well as toll service to all points in Western Pennsylvania. So it was planned to invite all the existing Independent companies in this section to combine or consolidate their interests and then to build exchanges in all the other important towns and connect all by toll lines. But this very sensible and very comprehensive project fell through when the Home company was sold out by the sheriff. However, in July, 1898, it was revived and ample funds to successfully carry it through were advanced by Chicago and New York capitalists because it was clearly evident that a new company would be successfully operating in Pittsburg within two or three years, and that with a Pittsburg connection these out-of-town exchanges would prove valuable property, while the value of service in Pittsburg would be materially enhanced by having a comprehensive out-of-town service.

It soon developed that several of the Independent companies were averse to making further investments and had little hope of ever securing a Pittsburg connection and welcomed a proposition to entirely absorb the property. So the syndicate started in to purchase properties that were offered at a bargain, before all plans were completed. Then, the syndicate incorporated the Federal Telephone Company and started in to carry its proposed work through to completion.

On August 1, 1902, the Federal Telephone Company controlled or operated, under lease, the following underlying companies, in addition to other companies in which it is interested:

McKeesport Telephone Company, McKeesport; Carnegie Telephone Company, Carnegie; Latrobe Telephone Exchange Company, Latrobe; Elizabeth Telephone Company, Elizabeth; Kiskiminetas Valley Telephone Company, Appolo; Pennsylvania Telegraph & Telephone Company, Beaver Falls; Washington County Telephone Company, Washington; Washington Telephone Company, Washington.

The foregoing eight companies are incorporated under the laws of the commonwealth of Pennsylvania. In addition thereto the following companies or telephone properties formerly listed in official telephone directory of the National Association are owned or controlled by the Federal Company: Leechburg Telephone Company, Leechburg; Ewing Telephone Company, Avonmore; Coraopolis Telephone Company, Coraopolis; Sewickley Telephone Company, Sewickley; Home Mutual Telephone Company, McDonald; Home Mutual Telephone Company, Houstonville, Home Mutual Telephone Company, Cecil; Home Mutual Telephone Company, Washington.

There the Federal Telephone Company has built or rebuilt and owns or controls and operates telephone lines, and is supplying telephone service in the following named cities, towns and villages in western Pennsylvania:

ALLEGHENY COUNTY.

*Bellevue X, *Avalon X, *Ben Avon X, *Emsworth X, Clifton X, Dixmont X, *Glenfield X, Hayesville X, *Osborne X, *Sewickley X, Edgeworth X, Shields X, Leetsdale X, Fair Oaks X, *Coraopolis X, *Esplen, *McKees Rocks, *Carnegie, Glenn, Woodville, Bower Hill, Bridgeville, *Elliott, *Millvale, *Etna, *Varona, *Wilkinsburg, *Wilmerding O, Wall O, *Pitcairn O, *East McKeesport O, *McKeesport O, *Versailles O, *Port Vue O, *Glassport O, Coursin O, *Duquesne, O, Dravosburg O, Belle Bridge O, Van Kirk O, *Elizabeth O, *West Elizabeth O, Lock No. 3 O, Wallace O, Kerr O, Park O, Bunola O, Elkhorn O.

BEAVER COUNTY.

Economy X, *Baden X, Remington X, Conway X, *Freedom X, *Monaca, *Aliquippa X.

WASHINGTON COUNTY.

*West Brownsville O, *California O, *Coal Centre O, *Elco (Wood Run) O, *Roscoe (Lucyville) O, *Stockdale O, Allenport O, *Speers O, *Charleroi O, *Monongahela City O, Black Diamond O, Shire Oaks O, Linden O, Hackett O, *North Charleroi O, Riverview O, New Eagle O, Courtney O, *Finleyville O, *Washington O, *North Washington O, *South Washington O, *West Washington O, *East Washington O, *Canonsburg O, *South Canonsburg O, Thomas Station O, Venetia O, Munntown O.

WESTMORELAND COUNTY.

*Monessen O, *Irwin O, Jacksonville O, *Latrobe, *Youngstown, *New Kensington, *West Newton, Gibsonton O, Hillville, Bagdad, *North Belle Vernon O, *Manor O, *Penn, Westmoreland City, Baggaley, Fausold's, *Hyde Park, *Avonmore, Salina, Ohio City.

FAYETTE COUNTY.

*Brownsville O, *Fayette City O, *Bridgeport O, *Belle Vernon O.

ARMSTRONG COUNTY.

*Freeport, Centre Valley, *Leechburg.

INDIANA COUNTY.

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*Incorporated boroughs or cities.

All towns marked X are interconnected by toll lines along the Ohio river. Towns marked O are interconnected by the Monongahela toll lines.

TELEPHONES IN GERMANY.

The telephone service of Germany is carried on by the post office department. According to an official report, the cost of the entire plant, up to April 1, 1902, amounted to about $42,000,000. Up to April 1, 1901, the cost had been $36,600,000. At the beginning of the present year, 2,024 places had public telephone stations, with 322,281 miles of line. These stations averaged 2,205,966 conversations per day, or about 804,000,000 per year. The following cities have the greatest number of public telephone stations: Berlin 51,561, Hamburg 20,823, Frankfort, 9,271, Dresden 8,914, Leipzig 8,725, Cologne 7,484. The total number of employes in this service is 8,189, of which Berlin has 1,712.

Revenge by Telephone.

"The papers in Hall vs. Grimes," said Johnson, my clerk, as he placed a bundle of typewritten legal documents at my elbow. "Second case in to-morrow's call."

"Yes, I remember," I replied, looking up from an evening paper unfolded before me on my desk. "I expect to remain here late to-night looking them over. By the way! The Leader announces in an editorial this evening that the O'Leary couple got their just deserts."

"So they did," returned Johnson, "but, by George, you never gave the defense a ghost of a show! Why, when you had finished Marshall was as weak as water. He couldn't have done much for 'em anyhow. It's good riddance of a dangerous lot."

Johnson paused and a serious look crept over his earnest face.

"But I have been doing a little thinking," he added with more sentiment than he was accustomed to show. "I don't want to pose as an alarmist, but if a man ever made enemies who are to be feared you are that man. Until the other O'Leary is with his accomplices I wouldn't care to be in your shoes."

I leaned back in my chair and laughed aloud. "Johnson, you're getting to be a regular old woman," I cried. "Come here, you croaker, and look in this drawer."

He did as directed and gazed down upon one of the most ferocious bulldog revolvers that ever was turned out of a factory.

"Now, do you think I can take care of myself?" I asked with a rather knowing toss of the head. "Here, take this cigar and keep quiet. It's time you were going home, anyhow."

"Well, you may know better than I," he remarked as he paused and leaned against the half-open door, "but if reports are true I would advise you to keep that thing loaded. Good-night!" The next instant the door slammed shut with a bang and Johnson was gone.

"Johnson's getting decidedly shaky," I soliloquized. "I suppose he's seen me in a hundred cases for the state, and yet he breaks out like this when a couple of assassins are put out of the way of working further mischief through my instrumentality. There's some mitigation when a frenzied creature flies out at another in hot blood at an apparent injury. But anarchists—cold-blooded, indiscriminate murderers. Pah! For them there should be no mercy."

My musings were suddenly interrupted by a Br-r-r-r-r from the telephone bell. Striding over to the instrument I took the receiver.

"Hallo! That you, Dick?" came the voice of Marshall. "You got the plum to-day, my learned brother, hang you! Never gave me a look-in. That gentle restraint usually assumed by the leader for the state was strikingly conspicuous by its absence. Quite a shock to me, I declare. You shouldn't outrage legal canons in that way, my boy, without due notice to the defense. Shall I see you at the club? What's that—busy! So'm I. You're against me in Grimes to-morrow, arn't you? Well, grind on, and do your best—you'll want it. I'll come and dig you out in an hour's time. So long." Br-r-r-r-r.

I resumed my seat with a smile. Though professional duty frequently made "Bully" Marshall and myself legal adversaries, in private life we were close-knit friends. Bully and myself were adepts at forensic hair-splitting. His ponderous style, which gave nervous witnesses into his hands, was a direct contrast to my suave, trenchant manner. When he shot up with his blustering "your honor, I object," the other attorneys in the room would look up with amused faces in anticipation of the wordy duel. No man better than himself knew how to bolster up a weak case. No man was quicker to seize an opening. A master of legal artifice, he had hoodwinked many a jury by unadulterated bluff.

Engrossed in marshaling my heads, I scribbled on, when suddenly a shadow from behind me crept over the paper in my hands, and even as I turned round a strong arm was thrown round my neck, a cloth was pressed over my face, the biting fumes of chloroform assailed my consciousness, and I passed into a pleasant dream.

I came back to a knowledge of my surroundings to find myself gagged and in a recumbent position on the floor. My arms had been trussed tightly behind my back, and my legs were securely tied with tough cord. My back was pressed against the bottom drawer in my heavy desk, and when I tried to move I discovered that my body was fastened securely to it by a cord that wound around its base. The knots cut into my flesh. My posture made struggling an utter impossibility.

Speechless and helpless, I gazed up bewilderedly at my assailant. He was enveloped in a dark mackintosh, and my gaze lingered dazedly on the discolored red lining inside the cape, which was thrown back over his shoulders. His sinister looking face was distorted with a look of savage exultation as he noted my return to consciousness. The next instant an evil smile crept into his eyes—a horribly expressive smile that made my blood run cold, and left me eager for his speech.

Coolly annexing one of my cigars, he lit it, and, stooping, puffed the smoke deliberately into my eyes.

"Good evening, Richard Carnel," he said quietly. "You're no doubt surprised to find yourself in your present constrained position. I regret the necessity, but do not mind being complimentary enough to say that, with a slippery individual like yourself, it is wise to take no chances. You may be interested in knowing that I have come to kill you."

The thing that impressed me most about my unexpected assailant was that he announced his purpose as coolly as though he were relating an amusing anecdote. For a second my heart seemed to cease beating. The next instant, in the throes of mortal terror, I was straining at my bonds like a frenzied madman. His outburst of mocking laughter fired me with the strength of a giant, but I might as well have been a helpless babe, for every move was in vain. He had secured me well, and finally overcome with my strenuous efforts I collapsed while the fiend was urging me with mocking taunts to persist.

"Good," he cried, as I gave up exhausted. "I like to see a man die game! Now listen to me! This day through your malignant eloquence you sent two men to a living death. I know you would say that you were but an instrument—that their fate was assured, whoever had prosecuted the indictment. This may be true, but I was in court all the time, and could plainly see that you were glorying in the task. You gloated over your victims as though you enjoyed the sport of it. Did you imagine that you could defy the O'Learys with impunity? Not so long as there is an O'Leary living outside of prison walls. This night, in this room, I mean to strike the blow that shall vindicate the brotherhood in the eyes of their comrades the world over. I mean to punish you as you deserve. If you had shown a shade of tolerance, a little reserve, you would have been spared. But you pursued them like a hungry hound on the trail and now you will suffer as you have made them suffer."

He threw the half-smoked cigar into a corner, and springing to his feet crossed behind me to the door. As he rose I noticed that he wore heavy rubbers over his shoes, which accounted for his noiseless entry into my office. In a moment he was again before me with a small black bag in his hand. With fixed, staring eyes I watched him as he set the bag down carefully on the floor. Fumbling through his pockets he produced what looked to me like the striker of an alarm clock. With nimble, nervous fingers he proceeded to attach this to the hammer of the telephone bell.

I followed every movement as a trapped animal watches its destroyer.

As he moved back and calmly surveyed his work, a sound of suppressed laughter escaped from his lips. Measuring off a space directly above the bell, he screwed a small hook into the telephone box. Immediately below he screwed another, and then turned toward the mysterious black bag, which was near him on the floor.

"No commonplace end shall be yours," he snarled malevolently. "You shall admit the method of your annihilation has the merit of originality at least. And, more than that, it shall be contrived by the hand of one as innocent of intent to murder as any child. Now watch me closely, my friend, and learn how the hand of death shall strike you."

He plunged his fingers into the bag and drew out a glass jar full of water, in which there appeared suspended an inner glass tube filled with some yellow liquid.

"If you are anything of a scientist," he said, drawing it slowly out, " you will know that this little tube requires delicate handling. Nitroglycerin, Shenstone? Do you recognize its appearance? The least shock to that fragile receptacle, and——" He elevated his eyebrows and smiled in my face significantly. "Now let me briefly explain the modus operandi.

"You will observe here, let into the side of the tube, the necessary percussion cap. You see, I attach the suspending wire to the hook—so, and this dependent wire to the other—so, which brings that little cap almost into contact with the extended hammer of the telephone bell. Now, my eloquent murderer, what do you imagine will happen when you are next rung up? Rung up! By heavens! that's the neatest touch of all!"

He laughed again—a hollow, mirthless laugh, like that of a madman.

"Take it away, you fool!" I wanted to shriek. "Don't you see that at any moment some one may call up?" My eyes must have flashed the words my lips were powerless to utter, for of a sudden the fiend stooped, and, hitting me a stunning blow in the face, hissed:

"Curse you, you dog! Lie there, and think when you hear the door locked upon you that your remaining spell on this earth is in my hands. I will not do it too hastily. You shall have a few moments for reflection before you are launched into eternity. O, yes, it would be cruel to kill a man like you without allowing time for repentance. Ten minutes—or perhaps a little longer. Make the most of it, I beg. Think, amongst other things, of all the poor devils you have sent to perdition. A few short minutes, and then, the girl will ring you up. Ha, ha!"

He rose, a fiendish glare on his face, and sprang to the door. Unexpectedly his eye must have caught the electric switch, for the next second the room was plunged into darkness.

"A good idea!" he snarled. "You shall wait for death in the dark—not knowing when it will come upon you."

The door clicked gently behind him. I heard the key turned in the lock and withdrawn, and as the soft pad, pad of his footsteps died away along the corridor I renewed my straining like a maniac. The cords tore into my flesh. The blood surged up in my head as if the veins that held it would burst. Knowing that every moment was vitally precious, I fought for my life with the desperate energy of despair, until, utterly exhausted, I collapsed, and lay supine and impotent. The imminence of an awful death froze my blood. Merciful heaven! If I could only free my hand! If I could but scream! This utter helplessness was horrible.

The inexorable tick-ticking of the clock on the mantel maddened my brain. Suddenly it struck the half hour. The sound fired me from the coma of despair into which my unavailing efforts had plunged me to make another spasmodic effort; but it was useless. My constrained position neutralized my strength.

The infernal assassin had given me no chance. Ten minutes! Five must have flown already.

Great heavens! What was that—a footstep in the passage? My brain was surely fooling me! But, no; it clanked nearer. Some one was rattling the handle of the door. "Hang the fellow; he's gone!" The voice—I knew it! It was Marshall—my friend Marshall—come before his time! Thinking me gone, he turned away.

Merciful heaven, he must not go! With the frenzy of despair I beat a tattoo with my heel against the desk.

"That's queer; it's all dark!" Marshall cried. "Dick, old chap," he shouted, "are you there?"

For an answer I kicked the wood energetically.

"By George!" he muttered, "there's something wrong. I'm going to investigate."

In fancy I could see him as, planting his feet against the opposite wall, he applied his shoulder to the door, and with the purchase thus obtained thrust with all his mighty strength.

Would he succeed in forcing it? Again and again he tried, dashing himself bodily against it, but in vain. Backing against the wall, he smashed at it with the flat of his heavy boot. The crash was followed by the sound of rending wood. It was yielding—it was yielding! Another mighty kick, and the hasp of the lock was torn bodily off and the door flew open.

In an instant Marshall's fingers found the switch and the room was flooded with light.

"Heaven and earth!" he cried, as he caught sight of my helpless figure. "What deviltry is this?"

Springing across the room, he forced the gag from my jaws and commenced to hack the bonds from me. My mouth was parched, and, utterly unstrung for a few seconds, although our lives hung on it, I could say no word. Then suddenly the reaction came, and I shrieked in mortal terror:

"Marshall, the tube!" He followed my gaze, and jumped to his feet. "Nitroglycerine!" I yelled madly. "Unhook it, quick, but carefully, Marshall, for your life! Place it in that jar."

In one bound he was at the telephone. The next second he had unhooked the dependent wire and had drawn the tube away from the hammer. And, as he held it in his fingers, before he could detach it from the hook at the top the call came. B-r-r-r-r! rang out the bell. When it ceased I was howling with mad, irrational laughter.

Marshall cooly unhooked the tube, suspended it in the jar of water, and took the receiver in his hand.

"Hello! who're you?" he yelled.

He waited a moment for the answer, but receiving none, with that never failing presence of mind that distinguished him, in a trice he had rung up the exchange.

"Where did that call come from?" he demanded. "Good! Put me through to the central police station. Hello! is that you, Sullivan? I'm Marshall. Tell the sergeant to come to the instrument at once."

"O'Leary gang, I suppose?" he queried, turning to me. "I thought so! That you, Jim? Attempted anarchist outrage at my friend Carnel's office. Tim O'Leary! Just left the Main street telephone call office. If you're spry you'll nail him. Get Sullivan to warn the railway lot. Right!"

Marshall's promptitude in warning the officials afforded them the opportunity to take my dastardly assailant in the act of boarding an outgoing train. I had the gratification of identifying him the next morning and later on of seeing him meet with his just deserts.—Lawrence Vanzile in the Chicago Tribune.

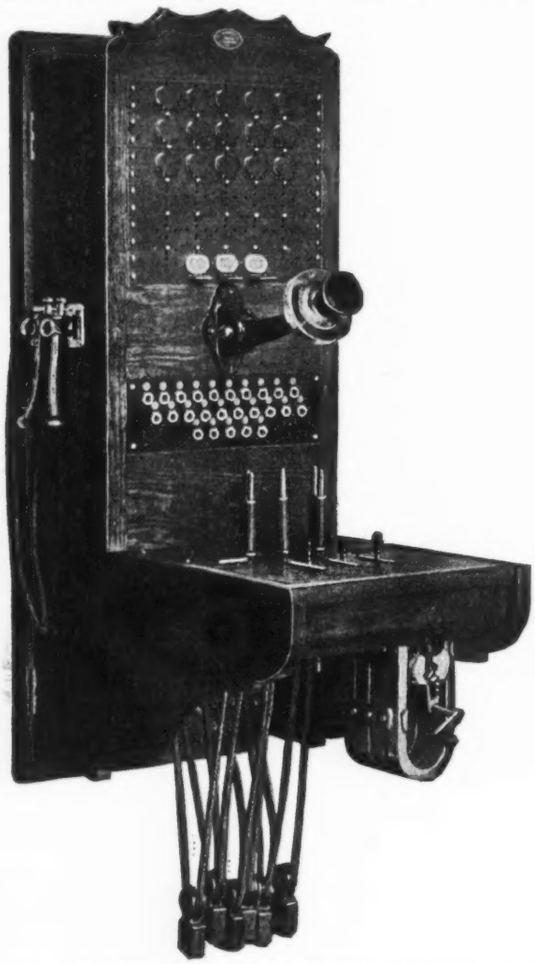
I am highly pleased with TELEPHONY, and I think every telephone man ought to have it.

FRANK KALINKA,
Manager Bowling Green Tele. Co.,
Dalton, Mo.

Manufacturers' Section.

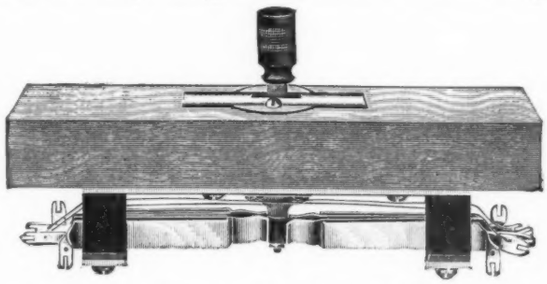
NEW HIPWELL SWITCHBOARD.

The Hipwell Manufacturing Company of Allegheny, Pa., has recently opened a general sales office at 69 Jackson Boulevard in the heart of the Independent telephone manufacturing district, where the company is placing on exhibition its latest types of apparatus, including switchboards, of the design hereinafter described, which are meeting with ready sale among the best posted operators of Independent exchanges throughout the country, and although this company has been engaged in the manufacture of switching apparatus for only a little over a year, is to-day one of the leading factors in the production of this class of appliances in exchanges where boards of moderate capacity are required, for instance, up to five hundred or six hundred



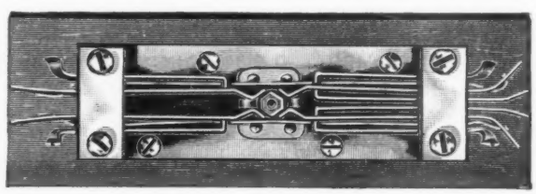
NO. 1. HIPWELL 25-DROP CAPACITY SWITCHBOARD.

numbers, in the equipment of offices anything short of where multiple jack boards are required. The company's flash light transfer system for making connection between distant sections of its standard board, of which we gave a general description in our issue of October, 1901, is considered among the very best, being perfectly adapted to meeting the requirements of this class of service, and the company is installing boards with up to 500 lines connected employing this system. In the accompanying cut, No. 1, we show the Hipwell 25 drop capacity switchboard employing a wall cabinet; cabinets are furnished of such capacity as are required to meet the demands of any special service. All of the boards are particularly well adapted for use not only in connection with local exchange lines but also long distance, high resistance, toll and party lines (including heavily loaded farmers' lines.) In view of the coils being incased in soft iron non-inductive tubes, the highest quality of insulation being provided throughout and the entire apparatus being free from inherent defects allowing of cross-stock and induction disturbances; the drops being highly sensitive; the tubular clear out drops being connected in the connecting cord



NO. 2. HIPWELL LISTENING AND RINGING KEY.

circuit, the coils in multiple; hence it will be seen that provision is made for maintenance of the balance of the lines which are connected one to another. All boards are of metallic circuit type, hence adapted alike for use in



NO. 3. HIPWELL LISTENING AND RINGING KEY.

connection with complete metallic circuits, common return wire systems, grounded circuits or a combination of the three as will be appreciated. This type of board is generally recognized as the "standard

NO. 4. HIPWELL SWITCHBOARD PLUG.

Bell style board." The listening and ringing key employed is shown in cuts Nos. 2 and 3, which has self-cleaning contacts and is absolutely positive and reliable in action; the lever employed is automatically restored from the ringing

NO. 5. HIPWELL SWITCHBOARD SPRING JACK.

position and the device recommends itself to experts generally. Cuts Nos. 4 and 5 show the Hipwell plug and jack.

This apparatus is being adopted by some of the best Independent exchanges.

CENTURY DESK SET.

The Century Telephone Construction Company, 481 to 489 Washington street, Buffalo, N. Y., with general offices at 336 Ellicott Square, Buffalo, N. Y., is preparing to put on the market several new lines of telephone apparatus on the most approved and up to date lines.

The company's No. 80 Desk Set, which is illustrated in its advertisement in this issue, is one of its new productions. The essential feature of this desk set is—all contacts in the switch hook are platinum pointed. The switch is absolutely positive in action and is so arranged that by simply removing a knurled cap over the switch all the contacts,

etc., can be examined. No tool of any kind is necessary to open switch cup for examination. All of the connections in the base of the telephone are exposed in such a manner that a mere glance will show up any trouble. The desk set is neat and handsome in appearance, and the mechanical construction of the very best.

This company reports a large and increasing sale on this instrument, as well as on all other instruments in their line. The company has in press a new catalogue which will explain fully its new instruments, which catalogue may be had upon request.

MR. J. A. RUSSELL.

Mr. J. A. Russell, manager of the Hipwell Manufacturing Company's Chicago office, is well known in both the Independent and Bell fields. He was born in Chillicothe thirty-three years ago. In the early eighties he entered the employ

J. A. RUSSELL.

of the Central Union Telephone Company as night operator at Peru, Indiana. He was shortly advanced to the position of inspector after which he came to Chicago to accept a position with the Chicago Telephone Company. He filled various positions with the company, and in 1894 entered the Independent field as an expert and superintendent of construction with the Western Telephone Construction Company with which company he remained about four years. From 1898 to 1901 Mr. Russell was associated with an automatic telephone manufacturer. In 1901 he entered the employ of the Hipwell Manufacturing Company of Allegheny, Pa., as traveling representative, which position he filled until recently when he took charge of the Hipwell Company's Chicago office. Mr. Russell is an aggressive worker, and enjoys a wide acquaintance with telephone men all over the country.

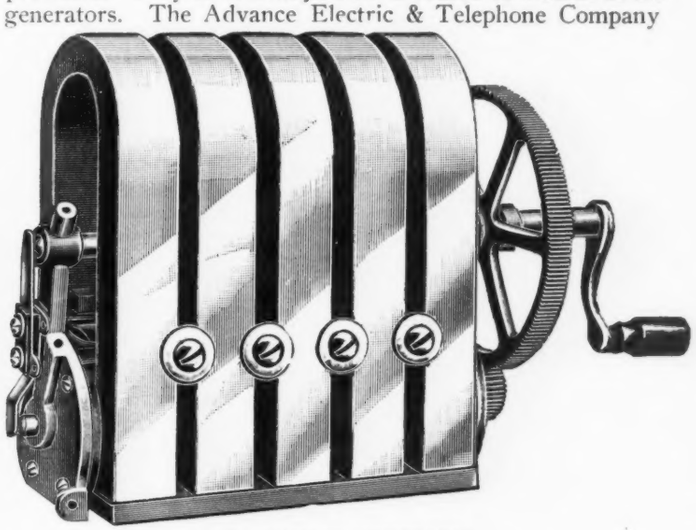
NEW ADVANCE APPARATUS.

The demand for a first-class telephone generator at reasonable cost has prompted the Advance Electric & Telephone Company to put on the market a new generator which will undoubtedly be highly appreciated by telephone companies, who have been using generators of different makes.

These new generators are made in the usual sizes—4 and 5 bar for bridging lines, and 3 bar for series work—are constructed to stand constant and hard usage and give an output that is second to none.

The experience gained by the company in making generators has enabled it to embody in this instrument the essential features necessary for a successful generator, all parts constitute the best of workmanship and are well proportioned. The armatures are made of softest iron to obtain the greatest permeability; the magnetic fields are used to the fullest extent without sacrificing the bearings which are of liberal lengths. The permanent magnets contain the best magnet steel obtainable and are subject to a special treatment which ensures great permanency. The gears are cast brass and very wide to prolong their life.

The muffler devices on pinion should be seen to be appreciated. They have always been a source of trouble in all generators. The Advance Electric & Telephone Company



NEW ADVANCE GENERATOR.

has succeeded in overcoming this uniformly weak point and has an exceptionally durable design.

The nickel plating of the magnets is of a very substantial and lasting quality.

The company has been obliged to increase its facilities to meet the orders which are coming in sooner than expected, but will be prepared very shortly to meet all demands.

GERMANY SECURES AUTOMATIC RIGHTS.

The German government has purchased the patent rights covering all Europe, with the exception of the United Kingdom and France, for the automatic telephone apparatus manufactured by the Automatic Telephone Company of Chicago. Charles Evelbauer, of the Deutche Waffen and Munitions Fabriken, who has been in Chicago studying the apparatus, has recently sailed for Europe. His firm will manufacture the equipment for the German government.

All the telephones in Germany are owned by the state. The installation of the American device will necessitate many operators seeking other employment, as one inspector can oversee a large system.

Under the new system every subscriber will have his own machine, and this will connect with a central automatic switchboard, where the call is automatically registered in decimal order.

INTERNATIONAL GENERATOR CALL TELEPHONE.

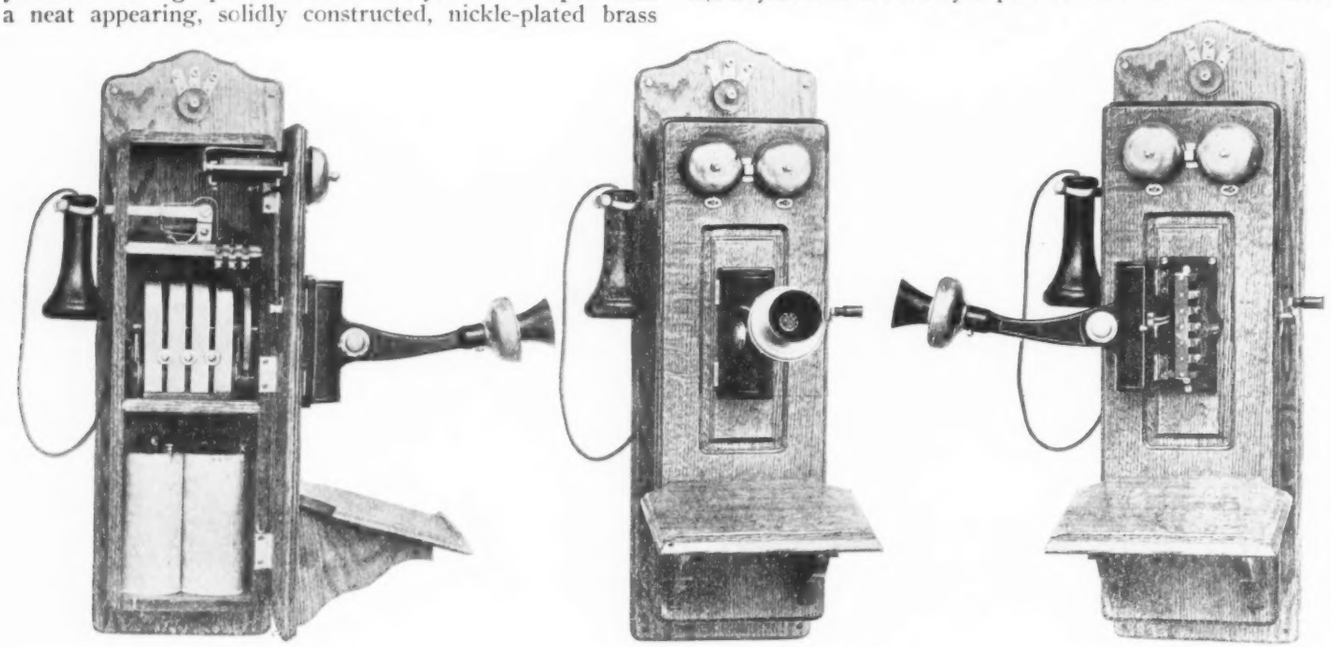
Among the various makes of generator call telephones that have been put on the market, there are probably none that have embodied in the construction of the detail parts more new features that are of vital importance to the durability and efficiency of a telephone system than in the apparatus recently evolved by the International Telephone Manufacturing Company, Chicago.

The company's dry battery set for exchange or toll line use, three views of which are shown, is a strictly long distance instrument. The cabinet work is of very neat design well finished and highly polished. The instrument is equipped with the company's long distance transmitter, which is already widely known for its far-reaching, clear and distinct talking qualities and its durability and lasting construction. The transmitter is mounted on the arm in a socket and fastened with a pair of set screws. The arm is hollowed for the two transmitter circuit cords, and it is hinged to the coil box by a wide, closely fitting joint for moving up and down. The joint is clamped with a neat appearing, solidly constructed, nickle-plated brass binding bolt and nut. The transmitter socket and arm joint is made accurate so that the arm is held solid in any position to which it is moved. The coil box is hinged to a sub-base. The induction coil, with all wire terminals and connections, is mounted on the sub-base. The box is provided with a lock catch, so when the sub-base is permanently fastened to the back board, the coil box may be closed, and locked with a screw driver. With this arrangement the instrument may be readily tested, without unscrewing the entire arm from the back board, and splicing the wires. The two cords for both sides of the transmitter circuit, shown at the induction coil, pass through the arm into the back of the transmitter and terminate on a pair of insulated binding screws, one on each side of the bridge from which the circuit is led direct to the front and back electrodes by two very light but substantial, punched metal parts, avoiding the use of any part of the transmitter frame, diaphragm, arm or any exposed metal part for any part of the circuit.

The generator, batteries, ringers, and switch are mounted in the cabinet back board, so that all working parts are convenient for inspecting and testing when the cabinet is opened. The ringers embody a number of new features on which the company has patents allowed. The frame is provided with a pair of thumb nuts at one side, between which is clamped the armature yoke, making a very convenient and reliable adjustment for the ringer. The bell hammer pin is provided with an adjustment so that it can be lengthened or shortened to correspond with the thickness of the board on which the ringer is mounted, so the hammer may be made to strike the gongs in the proper place to give the clearest tone.

The switch is a self-contained hook switch, neatly designed, substantially constructed, and built on the most practical lines. The base and hook are entirely insulated from the contact springs, and form no part of the circuit. The restoring spring, a German silver spring of nearly five inches in length, and the platinum point contact springs are so arranged that there are no rubbing or sliding parts, except at the working contact points, which form a good, clean, positive connection at all times.

The receiver is the company's double pole horseshoe magnet receiver. It is made that it may be adjusted and the adjustment locked by a pair of set screws with a screw driver. The diaphragm is clamped to a metal head by a metal ring, to avoid depending on the shell for holding any of the working parts. All metal and working parts are self-contained and completely enclosed in a genuine hard rubber shell and cap, leaving no metal parts exposed.



INTERNATIONAL TELEPHONE MANUFACTURING COMPANY'S DRY BATTERY TELEPHONE.

The International Generator Call telephones are said to be one of the most practically designed and durably constructed, strictly long distance instruments ever put on the market, combining, in nearly each working part, important improvements on which patents have been allowed to the company.

The F. Bissell Company, Toledo, Ohio, has moved into its new building at 226-228-230 Huron street, opposite the Nasby and the Home Telephone Co.'s building. This building is constructed especially to suit the company's business, and is one of the most up-to-date electrical supply and machinery houses in the country. The building is a four-story pressed brick structure with 31,200 feet of floor space. The company will carry a full and complete line of supplies for all departments of electrical construction and engineering, including telephony.

THE "MONOPLEX" TELEPHONE.

Owing to the rapid increase of private line telephones there is a growing demand for a first-class inexpensive telephone—that is, an instrument which "talks" perfectly, rings perfectly, which will not get out of order, and also finished in the manner that becomes telephone apparatus.

The Atwater-Kent Manufacturing Works of Philadelphia has devoted a great deal of time and considerable expense to developing an instrument of this type, which is now

THE "MONOPLEX" TELEPHONE.

being placed on the market under the name of the "Monoplex" telephone. A number of advantages are claimed for this type on short lines.

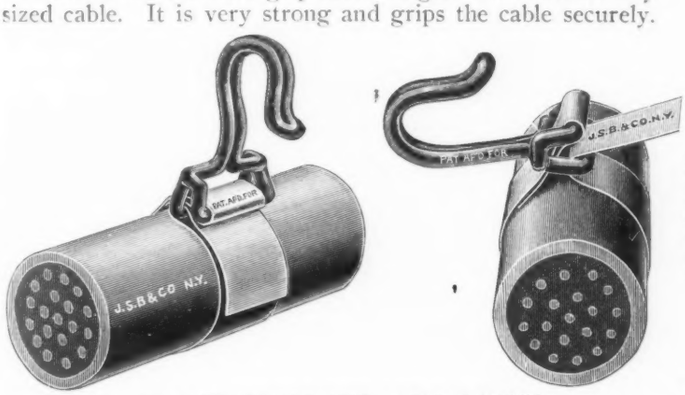
The hook has a long lever, and consequently there is a maximum motion at the contacts with the least motion of the hook. The receiver is of the watch-case type, and aside from the rubber ear cap is one piece. There is thus no chance for a change in adjustment or of parts becoming loose. There are no exterior binding posts connecting the end of the receiver cord to the box. This eliminates the danger of the cord becoming loose and the receiver is much more convenient to handle.

The finest grade of granular carbon is used in the transmitter, and it "talks" very distinctly. All connections are soldered, and the binding posts are so marked that there is no chance of mistake in connecting, and complete directions for setting up are sent with each telephone.

The telephone box is made of oak neatly finished, and the whole presents a very neat appearance. The "Monoplex" telephone is admirably adapted for use in offices, factories, hotels, apartments and private houses.

VILLARD DOUBLE GRIP CABLE HANGER.

The Villard double grip cable hanger is suitable for any sized cable. It is very strong and grips the cable securely.



VILLARD DOUBLE GRIP CABLE HANGER.

The hook and grip are of one piece of steel wire galvanized. The strap is of zinc.

The hook, once placed, stands erect while the cable is being drawn along the messenger wire to its resting place, making the messenger wire at any time easy to hook. While the strap is drawn closely around the cable, and is held with so much firmness, the grip does not in any way mar the cable, or imbed the strap therein. In using the Villard cable hanger, no lineman, with his carriage or saddle, is required to pass over the cable after the hooks are placed on the messenger wire to re-adjust the hooks, as is usual with other hooks, thus saving time, expense and risk to life in re-adjusting the hooks. The directions for using the clip are as follows:

Hold in the left hand with the strap resting against the cable and the hook turned back. Pass the free end of the strap under the cable and through the grip, pulling it up as far as it will go, and then stand the hook in an upright position. The raising up of the hook causes the grip to draw on both ends of the strap at the same time, from opposite directions, thus firmly binding and locking the hanger in position, and not allowing it to slip on the cable. The operation is so simple that any one can put on the hangers, and in the same manner every time. There is no hesitating to see whether the hanger is going on properly as is the case with some of the old style hangers. James S. Barron & Company, West Broadway and Franklin streets, New York, are the sole agents for the Villard double grip cable hanger, and will be pleased to send full information and prices upon request.

NEW CHICAGO PAY STATION.

The Chicago Pay Station Company, Chicago, has made some additional improvements in its pay station device. Below is an illustration showing the improved directions card which will be used on this machine in future. The illustration also shows a modification of the pattern shown in

NEW CHICAGO PAY STATION.

its advertisements in that the coin window and rejector pocket features do not show. This is a lower-priced machine which the company is now prepared to furnish, and which has embodied in it all the latest improvements excepting the coin window and rejector pocket features.

THE "STANDARD" OF MADISON.

The Standard Telephone & Electric Company, Madison, Wis., is now furnishing its new types of apparatus, including telephones for selective party-line work. The new "Standard Y" generators and ringers are considered to be mechanically and electrically among the best now upon the market. The midsummer business of the "Standard" is phenomonally large.

TRADE NOTES.

THE EASTERN AUTOMATIC TELEPHONE COMPANY, Boston, Mass., has removed its offices to 161 Summer street.

COMMERCIAL ELECTRICAL SUPPLY COMPANY, Toledo, Ohio, is building a central energy telephone plant of 1,000 subscribers, at Clarksville, Tennessee.

THE STANDARD ELECTRIC COMPANY, Erie, Pa., has been incorporated under the laws of Pennsylvania, and has changed its name to that of the Federal Electric Company.

THE ELECTRIC APPLIANCE COMPANY, Chicago, Ill., is distributing a new telephone and telephone supply catalogue. The company also distributes a new catalogue showing a full line of rubber-covered wires and cables.

AMERICAN MINIATURE & DECORATIVE LAMP COMPANY, 436 Broome street, New York, is sending out an interesting booklet, vest pocket size, containing valuable lamp data. This booklet is illustrated and will be found invaluable to lamp buyers.

CHICAGO FUSE WIRE & MANUFACTURING COMPANY, Chicago and New York, will send upon request its latest illustrated price list, which contains net prices of the company's entire line of "protective devices" and will be sent to any address upon request.

THE STERLING ELECTRIC COMPANY, La Fayette, Ind., is sending out to exchange companies its latest wall poster, printed in red. This poster contains cuts of a great number of pieces of Sterling apparatus specialties and will be sent to any address upon request.

LAIRD & LEE, Chicago, Ill., are publishing a convenient little vest-pocket book, entitled "Practical Compend of Electricity," which contains a considerable quantity of useful elementary information concerning the principles of electricity and magnetism.

THE STANDARD TELEPHONE & ELECTRIC COMPANY, Madison, Wis., is issuing a series of leaflets, each one of which illustrates a piece of standard apparatus. These leaflets are inclosed in a folder and a complete set will be sent to any address upon request.

THE TELEPHONE BURGLAR & FIRE ALARM COMPANY, Rochester, New York, has isued a catalogue on the "Phonolarm," which is a device for the protection of property against burglars and fire. The catalogue contains illustrations, diagrams and a detailed account of the "Phonolarm."

THE STANDARD VITRIFIED CONDUIT COMPANY, New York, is distributing a folder illustrating its new form of multiple duct, standard single duct and self-centering. Mr. R. W. Lyle is president and general manager of the company, and Mr. B. S. Barnard is vice-president and secretary.

STUART-HOWLAND COMPANY, Boston, Mass., report great activity in business. They now have twelve salesmen on the road calling upon the electrical trade throughout the greater part of the United States and Canada. Their foreign trade is also increasing and is quite a factor in their business.

WOTTON ELECTRIC & MANUFACTURING COMPANY, Atlanta, Ga., has recently installed an up-to-date cabinet shop, and is prepared to fill orders promptly for annunciators, etc., in regard to which they have just issued a neat little bulletin, which is now about ready, and which brings out very prominently the features most vital in the manufacture of this important class of apparatus. The condenser is always worth consideration, and copies of another bulletin on it should be also secured.

THE AUTOMATIC ELECTRIC COMPANY, Chicago, Ill., has just issued a new catalogue on "automatic apparatus." This catalogue contains a full description of the automatic system and is one of the most complete and best printed catalogues of its kind. It will be sent to prospective purchasers of apparatus upon request.

THE UNIVERSAL TELEPHONE RECEIVER COMPANY, 314 Medinah Temple, Chicago, Ill., is issuing a little folder illustrating and describing the company's universal telephone receiver holder. The circular contains a description of this piece of apparatus as well as directions for installing. Also testimonial letters from users.

THE WILHELM TELEPHONE MANUFACTURING COMPANY, Buffalo, N. Y., has recently issued catalogue No. 11, illustrating and describing the company's "Interior Telephone System." The book is well printed and contains considerable data of interest, especially to prospective buyers of intercommunicating systems.

THE ELECTRICAL STORAGE BATTERY COMPANY, 19th street, Philadelphia, Pa., has recently printed a little booklet on "Chloride Accumulator." This form of battery is specially adapted for telephone, telegraph and laboratory work. The booklet is illustrated with types of batteries and will be sent free to any part of the world upon request.

A. KLIPSTEIN & COMPANY, 122 Pearl street, New York, calls attention to their "Electric Brand" sal ammoniac, which has been before the public since 1890. This sal ammoniac is said to be absolutely free from acid and metallic impurities and is almost chemically pure. The company will send to interested parties, descriptive matter upon request.

NORTH ELECTRIC COMPANY, Cleveland, Ohio, has ready for delivery the second edition of its booklet on "Dividend Payers in Small Exchanges." This booklet is one of the most artistic so far issued by any telephone manufacturing company, and should be seen by every man interested in high grade telephone equipment. This book will be sent free upon request.

THE STERLING ELECTRIC COMPANY of Lafayette, Ind., believes it is securing its share of the common-battery telephone installations now building or in prospect. The company reports having secured in the last week contracts for complete exchange equipment and telephones at the following points: Newark, Ohio, 3,000 capacity; Davenport, Iowa, 4,000; Rock Island, Ill., 4,000; Moline, Ill., 3,000; Paris, Ky., 3,000.

THE INDIANA STEEL & WIRE COMPANY, Muncie, Ind., recently fitted a special department in its wire mill for the manufacture of high grade telephone and telegraph wire, and is turning out a product that is being well received by the users of this wire. The manufacturer claims highest conductivity, greatest strength combined in a wire that is tough yet very pliable and easily handled and most heavily galvanized. Samples and prices will be sent on application. Kindly mention TELEPHONY when writing.

THE GEO. WORTHINGTON COMPANY, Cleveland, Ohio, has issued a very handsome catalogue in paper cover, devoted almost entirely to electrical apparatus and supplies.

There are no fewer than 150 pages, all of which are profusely illustrated, while details are given of the apparatus, with prices. The book includes annunciators, electric gas lighters, push buttons, switches, lamps, cable clips, pulley blocks, conduit, magnetos, electric motors, fuses and fuse blocks, insulated wire and cables, small generators, insulating materials, etc. Several hundred cuts are shown.

THE CHICAGO FUSE WIRE AND MANUFACTURING COMPANY, Chicago, Ill., states that since offering its souvenir paper-weight a few weeks ago, this little article is in great demand. Already a great number of them have been sent on requests from customers. The company has had a large number of requests from others on the proposal to send this article for ten cents to cover postage and packing. The company reports a steady increasing demand for its popular line of fuse wire and links and telephone supplies.

THE AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, Ill., has received an order from the Topeka Independent Telephone Company, of Topeka, Kan., for an additional equipment switchboard for 500 subscribers' lines, to be installed immediately. The Topeka Independent Company has a splendid new central energy system, and this is the third increase made inside of three months. All of which goes to show the appreciation by the public of the effort made by Independent companies who give the best service possible.

THE W. G. NAGEL ELECTRIC COMPANY, Toledo, Ohio, has published a neat and convenient blank *form* for *estimates* for telephone engineers who contemplate new work or rebuilding. This estimate blank contains 236 items, printed, lined and ready for the insertion of quantities and prices of supplies. This is not only convenient, but makes a good record to retain for checking up costs of construction, future estimates, etc. Copies mailed free on application.

This company has ready also for distribution its new bulletin No. 3 and discount sheet on pole line construction material.

JONES & WINTER, 1259 Monadnock Block, Chicago, Ill., finds no stagnation in business for the summer season. The company has contracts and is now erecting a 1,200-line exchange for the People's Independent Telephone Company, Paducah, Ky.; just commenced a 750-line exchange for the Jackson Home Telephone Company, Jackson, Tenn.; a 600-line exchange for the Stephenson County Telephone Company, Freeport, Ill. They are nearly completed and will have in use within the next thirty days a 1,000 line exchange for the Home Telephone Company, Rockford, Ill., and another 1,000-line exchange for the Wichita Telephone Company, Wichita, Kan.

THE STANDARD POLE & TIE COMPANY, of 44 Broad street, New York, has just completed the delivery of its second large order from the Central New York Telephone & Telegraph Company of Utica, N. Y.

The poles which have been supplied are the Southern White Cedar or Juniper poles, of which the Standard Pole & Tie Company make a specialty. The company began to introduce this pole in the northern market about two years ago, and now it reports that the orders are coming in as fast as they can be handled. The main reasons for the extreme popularity of the Juniper pole are its freedom from butt rot and its symmetry and straightness.

The poles ordered by the Central New York Telephone & Telegraph Company were for use at Utica, Syracuse and vicinity, and were delivered faster than the company was able to use them in its construction.

MERTON H. BENTLEY.

Mr. Merton H. Bentley, electrical engineer for the International Telephone Manufacturing Company, of Chicago, has just returned from a trip through England, France, Germany, Spain, Holland and Italy, where he has spent over four months in the principal cities, and also in the rural districts of the various countries, investigating principally the developments of telephone equipment there, and the possibilities for apparatus from this country.

Mr. Bentley, whose portrait is shown herewith, was eminently fitted for an investigating tour of this kind, having always been a careful reader of all subjects pertaining to electricity and telephony and having a thoroughly practical experience in all its branches. He has been a prominent member of the American Institute of Electrical Engineers for more than sixteen years. He entered the electrical field nearly twenty years ago, in the telegraph

MERTON H. BENTLEY.

business, holding various positions as railroad and commercial telegraph operator, telegraph wire chief, and in railroad despatcher's offices.

With a good knowledge of electricity, from a practical standpoint, he received a technical course at the Rose Polytechnic Institute. Later he took charge of the electrical and mechanical equipment of the Ciero and Proviso street railway system of Chicago. He also supervised work for the Chicago Edison Company.

About ten years ago he entered the telephone field with the Chicago Telephone Company. He held various positions in all branches of the work, and for over five years was prominently identified with the engineering staff of that company, having the direct supervision of all power work pertaining to the new exchanges, and later occupied the position of chief clerk of the engineering department.

Early this year he accepted his present position, and at once started his European trip. Since his return he has taken charge of the company's engineering work and superintending the installations of its multiple switchboard systems and central energy plants, in which line it is now among the foremost manufacturers in the world.

Monarch Telephone Manufacturing Company.

The Monarch Telephone Manufacturing Company, Chicago, is one of the prominent makers of Independent telephone apparatus. While practically a young company, being organized and incorporated in June, 1901, it enjoys a very prosperous business and its growth has been phenomenal. The company was organized by Mr. Ernest E. Yaxley, who saw a future for a company making a modern line of telephone parts. Associated with him in the enterprise, were Mr. John E. Norling, who is now president of the company, and Mr. Julius C. Hubacher, who is its secretary and has the general superintendency of the plant. Mr. Yaxley is treasurer and general manager. That the company's product has met with favor is evidenced by the fact that it was found necessary to increase the factory space three times since it was organized. On the opposite page is shown the manufacturing plant of the company, and on the pages following are shown views in the different departments. The product of the company comprises a complete line of telephone parts, including generators, ringers, extension bells, transmitters, receivers, coils, condensers, etc. The apparatus of the Monarch company is modern and up-to-date and has gained a wide degree of popularity. It might be of interest to give, in a brief outline, a sketch of the three men to whose efforts the success of the Monarch company is due.

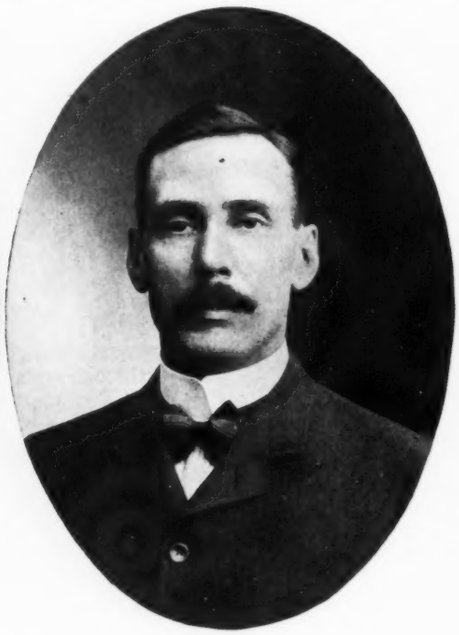
Mr. John E. Norling, the company's president, has been in active business since 1880. He was formerly secretary and treasurer of the Milford Heater Company of Galva, Illinois. He has been very successful in the real-estate business and has promoted several industrial enterprises. He is extensively interested in the mining and cattle business in the west and is the owner and publisher of the "Svenska Tribunen," one of the oldest and largest Scandinavian newspapers in the United States; he is also president of the Globe Automatic Telephone Company of Chicago, and a director of the Illinois Mutual Fire Underwriters of Chicago. Mr. Norling is a gentleman of sterling character and enjoys a very wide business acquaintance.

Mr. Ernest E. Yaxley, the company's treasurer and general manager, is too well known in the Independent field to require more than brief mention. He was born in Hillsdale, Michigan, forty-two years ago, where he got his early electrical and mechanical training, and came to Chicago in 1882. He has spent nearly all his time in designing telephone and electrical apparatus. He is a mechanical and electrical engineer and has been identified with a number

of prominent telephone manufacturing companies. He is an inventor of note and has designed a great deal of the apparatus now in use in the Independent field. Mr. Yaxley got his early telephone experience with the Western Electric Company, Chicago, and is one of the pioneer manufacturers among the Independents, having entered the field the day after the Bell receiver patent expired. Mr. Yaxley is a gentleman of high attainments and is very popular among both the manufacturers and exchange men.

Mr. Julius C. Hubacher, the company's secretary and the general superintendent of the Monarch plant, is a man who has devoted a great many years to the mechanical perfecting of telephone apparatus. He was born in Canton, Ohio, in 1863. At an early age he took up mechanical

JOHN E. NORLING.



ERNEST E. YAXLEY.

JULIUS C. HUBACHER.

engineering, at which profession he has become an expert. At the inception of the Independent movement he saw opportunities offered a man with a thorough knowledge of mechanics and has devoted his time to that branch of the business up to the present. He is considered one of the best mechanical engineers in the telephone business and his success has been deserved. Mr. Hubacher is unassuming and has considerable managerial ability. It is to these three men that the success of the Monarch Telephone Manufacturing Company is due.

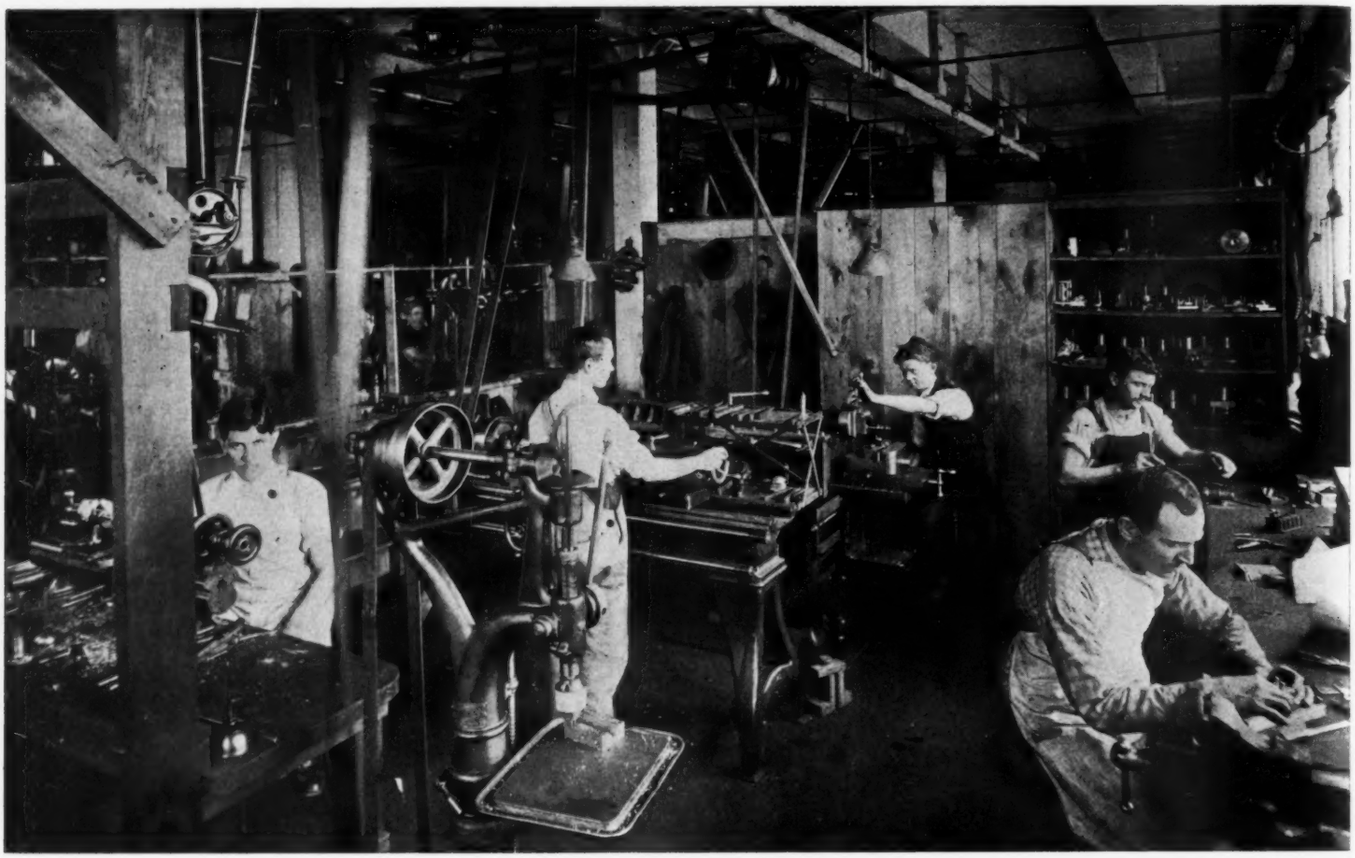
PLANT OF THE MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.

FACTORY OFFICE, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.

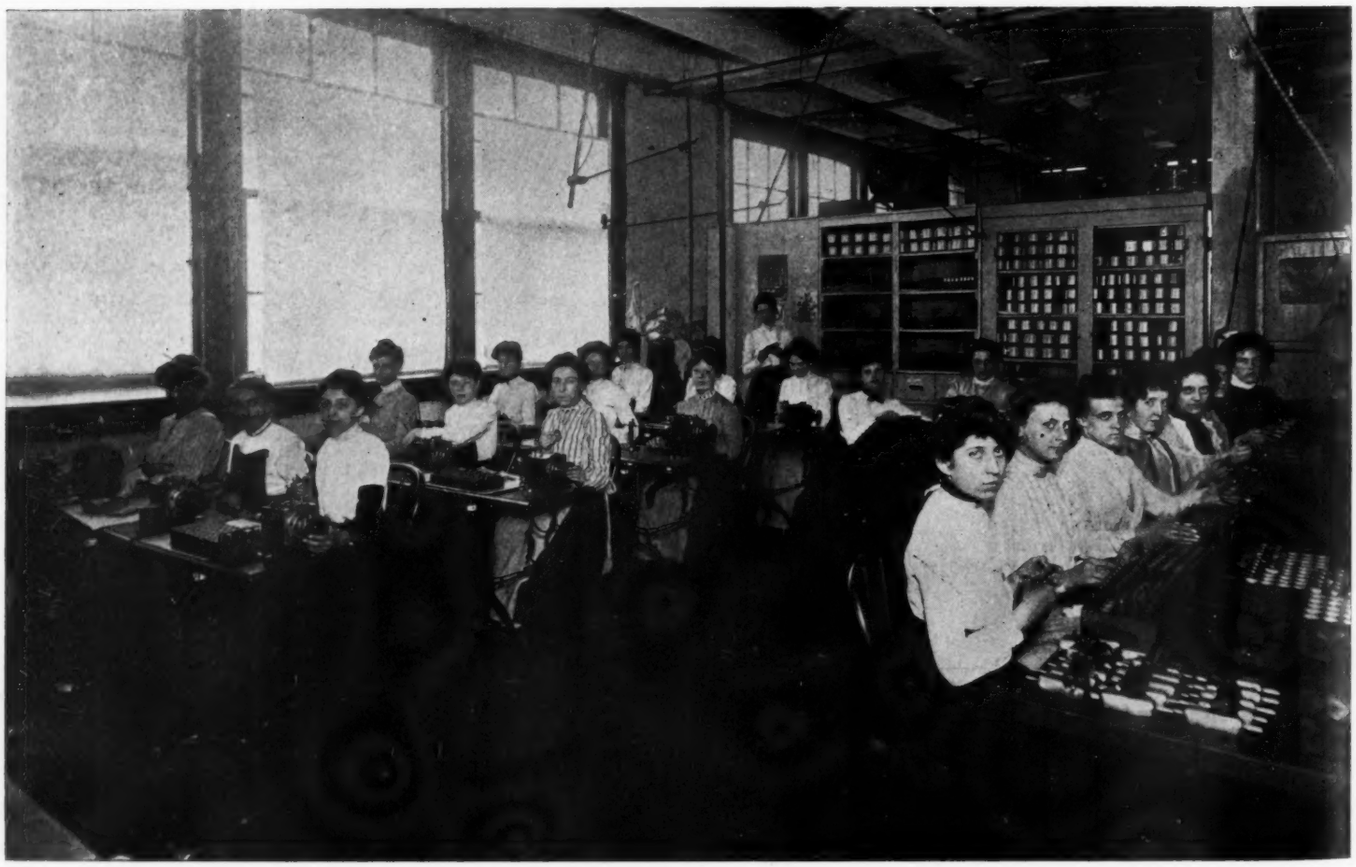
GENERAL VIEW MACHINE DEPARTMENT, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.

SECTION SCREW-MACHINE DEPARTMENT, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.

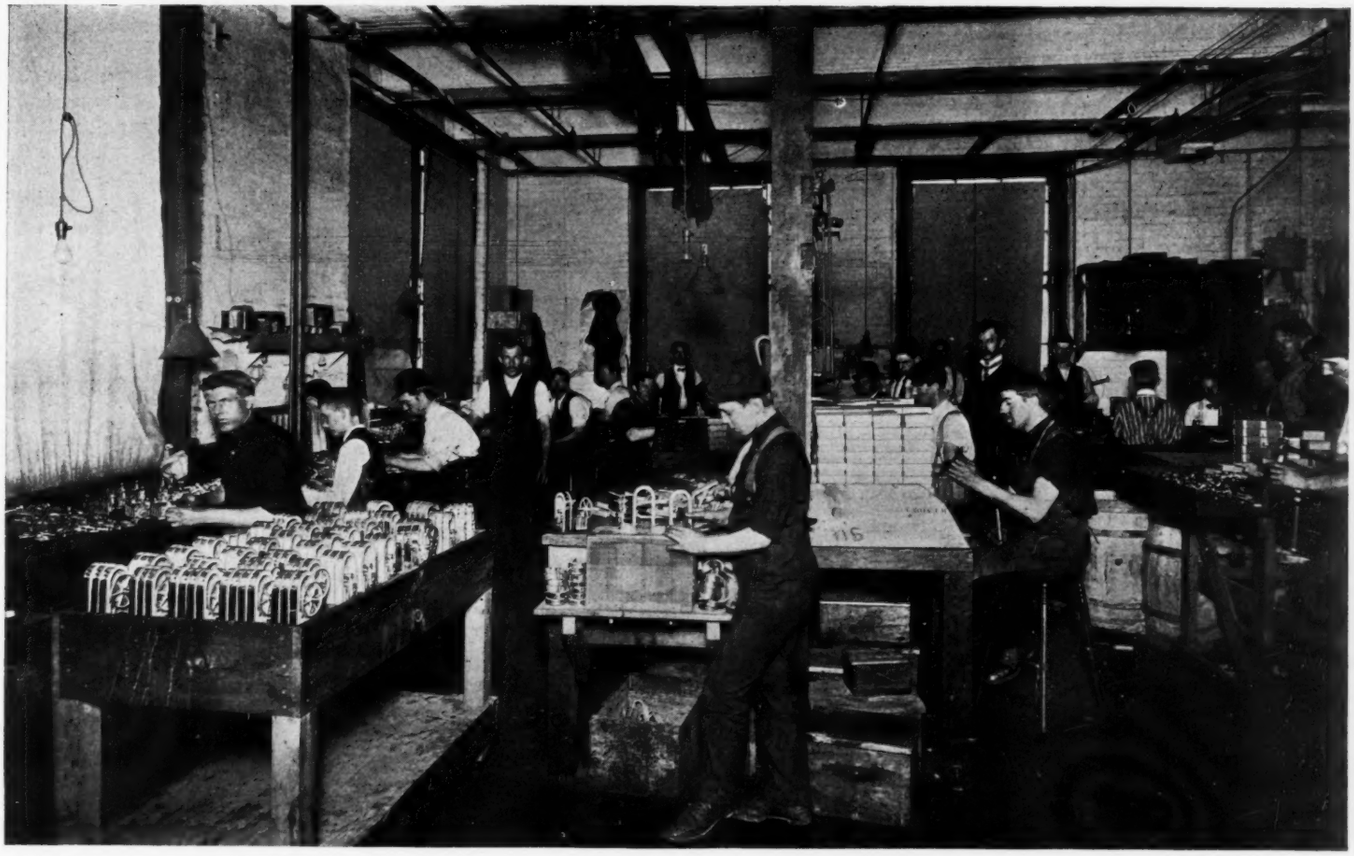
DRILL PRESS DEPARTMENT, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.



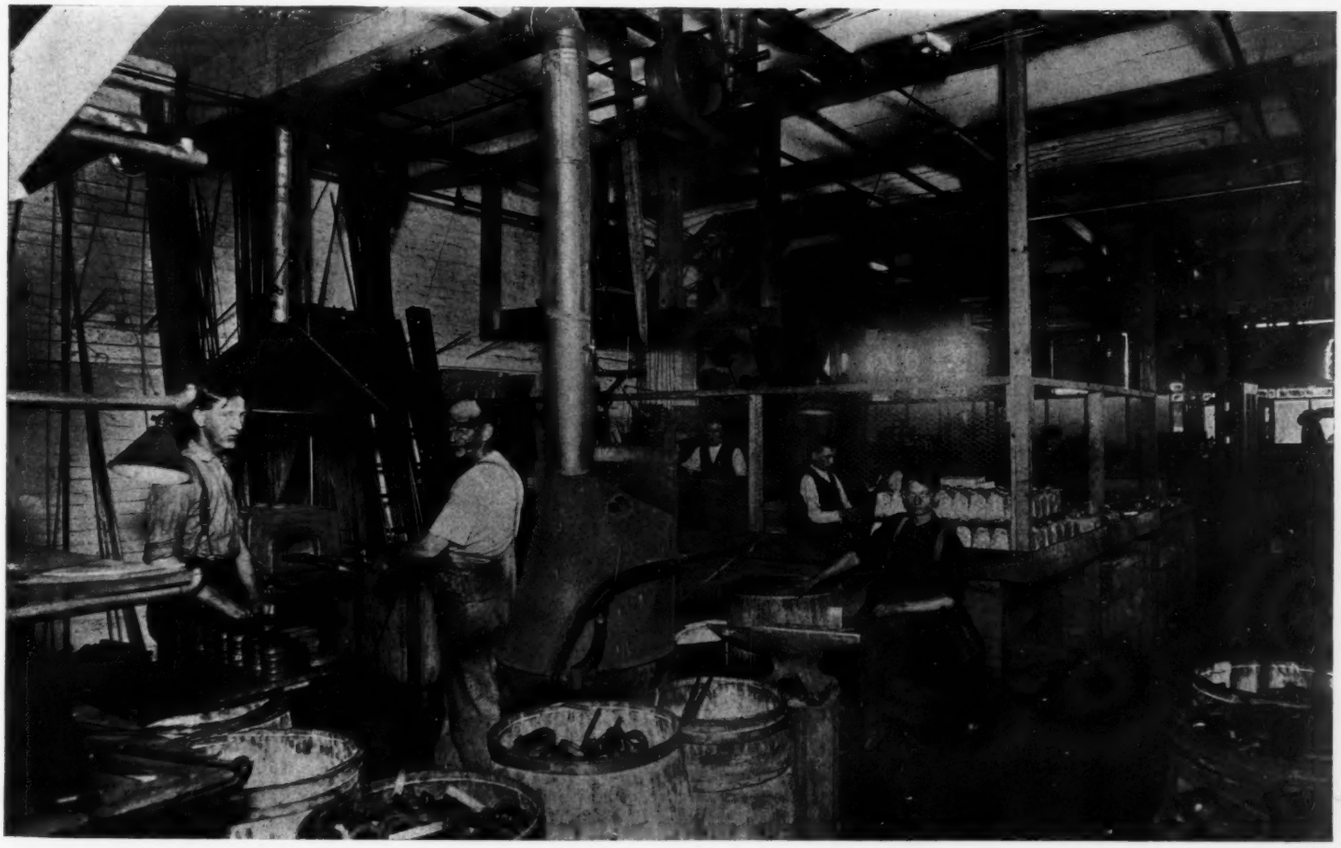
VIEW IN TOOL ROOM, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.



COIL WINDING DEPARTMENT, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.



CORNER IN ASSEMBLING ROOM, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.



MAGNET DEPARTMENT, MONARCH TELEPHONE MANUFACTURING COMPANY, CHICAGO.

MR. J. L. PUTNAM.

Mr. J. L. Putnam, the manager of the Clark Automatic Switchboard Company of Providence, R. I., was born at Houlton, Me., June 17, 1874, and received his early education in the public schools of Boston, Mass., afterwards entering the Massachusetts Institute of Technology where he took a complete course in electrical engineering. After graduating Mr. Putnam entered the employ of the American Telephone and Telegraph Company remaining with this company for five years. He resigned from the company in October, 1900, to accept the position of engineer with the Clark Automatic Telephone Switchboard Company, and a year later was made manager of the company, which position he now holds.

The Clark Automatic Telephone Switchboard Company of Providence, R. I., own and control patents covering the Clark automatic telephone apparatus, a mechanical

J. L. PUTNAM.

and electrical device for doing away with all central exchange manual operating and consequent expense. The originator of this device was Emory A. Clarke, local manager of the Bell Telephone Company's exchange at Sioux City, Iowa. The patents covering this mechanism were later acquired by Judge A. Van Wagenen of Sioux City, who made further improvements on the original apparatus, interested eastern capital and through E. M. Prindle & Co. of Providence, R. I., organized the present company in June, 1900.

This company has during the past eighteen months established its agencies in all the leading cities in the United States, acquiring representatives in Europe, South Africa, Canada, Mexico and Hawaii and has the Clark automatic telephone system in operation in Scotland, England, Holland, Germany, Spain, South Africa, South America, Hawaii and Canada outside the limits of the United States, these plants embracing some of the leading electrical concerns in the various countries.

While the Clark system is adapted for manufacturing plants its chief field is undoubtedly the small town where an installation can insure a handsome return on the investment because of the small cost of maintenance entailed. On the other hand, it can be readily operated in connection with large central exchanges thereby placing the small town installation on a profitable basis in addition to the manual exchanges in connection with which it works.

The present officers of the company are Hon. E. L. Freeman, president; Mr. J. W. Phillips, vice president; Mr. Moses E. Torrey, treasurer; Mr. Alfred S. Clarke, secretary, and J. L. Putnam, manager.

THE SKEPTIC IN TELEPHONY.

The skeptic has lived in every age—he has thriven in every clime. No matter how broad the subject; how strong the evidence, you can always count on the fellow who wisely shakes his head and emphatically says, "It can't be done." Even the confuting of skeptics who have antedated him does not appear to have dampened his pessimistic ardor. From the original doubting Thomas to the most up-to-date specimen of the unconvincible from Missouri, there are those who will not believe until they have seen.

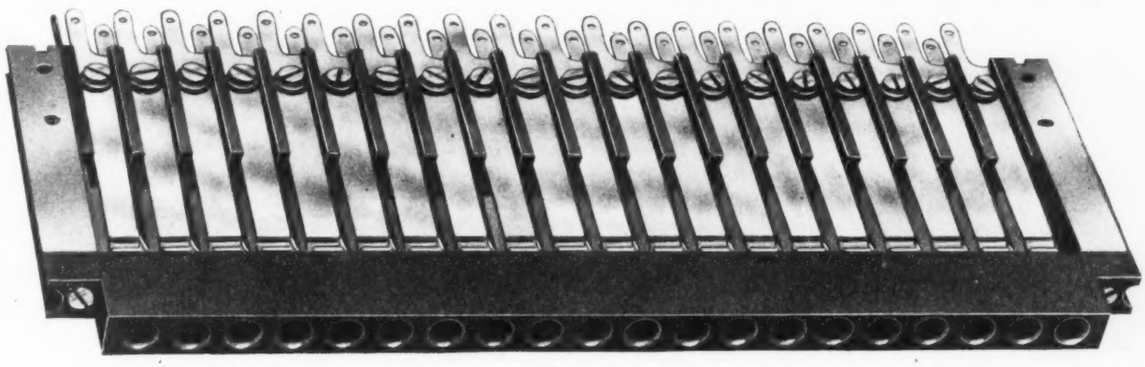
Telephony has had its share of skeptics from the beginning. The telephone itself was born and nursed in an atmosphere of skepticism. Indeed it is now almost surprising that the little waif should have been able to survive the coldness or indifference which met its early talking efforts. Even that otherwise patriotic and practical American, General John A. Logan, is credited with refusing to give $2,500 for a half interest in the invention, but very kindly consoled Mr. Bell for his supposed disappointment by saying, "I dare say your machine works perfectly, but who would want to talk through such a thing anyway? I advise you to save your money, young man." The optimistic Mr. Bell must have decided to discard this conservative and inexpensive advice, if we are to judge by the millions throughout the world who appear to have become so accustomed to "such a thing" that they wouldn't know how to transact their daily affairs if deprived of it. But even this was not a knock-out for the skeptic. Later on we find him again in the ring pooh-poohing the possibility of successful opposition to the Bell monopoly and once more sententiously declaring "It can't be done," and although the present extraordinary development of Indepenedent telephone companies might in itself be regarded as an all-sufficient and conclusive answer to the Prophet of Failure, do not for a moment believe that he has gone out of business. He is still in evidence. We have had him with us right along. He grows perniciously active with each step taken toward radical improvement. He doesn't like anything which he regards as revolutionary. He croaked long and loud when some one whispered the possibility of telephone connections being made automatically. He sneered at the first crude efforts to make it practical. He chuckled at each set-back and laughed aloud at any apparent short-coming or overlooked detail, but nevertheless, the undiscouraged prognosticator of inability to achieve new things because they are new, again emphatically declared, "It can't be done." The believers in the practicability of the automatic idea plodded steadily on, devising, improving, changing, correcting, testing, but advancing ever.

If this particular skeptic or others of the same school still retains any real doubts as to the practicability and the growing popularity of the new departure in telephony, he is very likely to be promptly relieved of his self-imposed burden of dubiousness if he will visit the factory of the Globe Automatic Telephone Co., 153-155 Jackson boulevard, which

has persistently devoted itself to the development of the automatic idea and whose busy, bustling, capacious establishment ought to be the most convincing evidence of a great and growing demand for the "Girl-less 'phone," as the new instrument is familiarly called, in view of the lack of necessity for an operator. An examination of the new calling device which controls the switching operations will certainly be interesting. This comparatively simple arrangement, usually placed on the front of telephones being manufactured by these automatic pioneers is detachable and capable of being worked in conjunction with telephones of any make, practically rendering the latter automatic when connected with one of their new individual switches placed at central. No one, no matter what his opinion as to the relative merits of the automatic and other systems may be, can take leave of this very interesting landmark in the field of Independent telephony without feeling that the proprietors and others connected with the establishment are fully satisfied that they have succeeded, to the full measure of their expectations, in perfecting a system which they do not doubt and is even now operating to revolutionize telephone systems everywhere; but more particularly in smaller towns where an operator's salary and other exchange expenses cut deeply into the profits arising from a limited number of subscribers. It is claimed that the cost of maintenance of the automatic system for nearly two years past in successful operation at Medford, Wis., is only two per cent of the income, and if this is so it is apt to prove a very effective argument for the Globe Automatic Telephone Company.

THE SMALLEST MULTIPLE SPRING JACK.

A piece of apparatus that has received a great deal of attention from prominent telephone men is a 3-10 inch center multiple spring jack built by the Kellogg Switchboard & Supply Company. The model of this jack was shown for the first time at the Inter-State Telephone Convention held in Chicago. It will give one a good idea of the size of the jack when it may be stated that the accompanying illustration shows this jack actual size (6¾ inches long). The jack is known as a two-conductor jack, and is built of the best grade of hard rubber, brass and German silver. The front strip is of solid hard rubber drilled to receive the sleeves. The ends are of heavy brass of the same thickness as the jack. The springs are mounted on a milled strip of hard rubber, which is fastened to a heavy strip of brass. There being only one spring in the jack and two contacts in the plug, the 3-10 inch jack can be built substantially and have as high insulation resistance as most jacks on ⅜ inch centers.



SMALLEST MULTIPLE SPRING JACK EVER BUILT.

This type of jack will be used in the 18,000 line switchboard, which the company is building for the Frontier Telephone Company, Buffalo, N. Y., and also in the 15,000 line switchboard being built for the Home Telephone Company, Los Angeles, Cal.

An illustration of the amount of work involved in building the multiple jacks alone for a 15,000 line board, may be gained by the following brief facts: The ultimate number of spring jacks required for a board of this size is 645,000. The ultimate number of strips of multiple jacks is 32,350. The spring jacks for the ultimate equipment placed one on the end of another would reach 30½ miles. The strips of multiple jacks, placed one on the end of another would reach 3½ miles. The total number of strips (32,500), even though only 3-10 of an inch thick, piled one on top of the other, would make a column 812½ feet high.

THE INDEPENDENT TELEPHONE SITUATION IN DETROIT.

With the defunct Michigan Bell Company in the very uncomfortable position of practically necessitating a disolution of the company as the only feasable remedy for its present difficulties, the Co-Operative Telephone Company, of Detroit, is making rapid progress in establishing an exchange in that city to reclaim to the Independents about the only territory in which the Michigan Bell has a monopoly. While it would be hardly probable that the Bell company ever would be in position to repeat its policy of a few years ago, when it bought up the opposing company at a figure on which it has been unable to pay the interest on its bonds, and which was one of the causes of its downfall; yet it may be interesting to know that the Co-Operative company's franchise would prevent any action of this kind, as well as the principles of the organization itself. Detroit having always largely favored municipal ownership of public utilities, has made the Co-Operative proposition a very attractive one to the people, especially its being for a purpose of relief from forced inefficient service at exorbitant rates by an inconsiderate monopoly; as well as being a good proposition from a financial point of view.

The company secured a very liberal franchise, having besides the usual privileges, the right to use the city's conduits, pole lines and public buildings unoccupied, at a maintenance rental. The city owning its electric lighting system, etc., makes this privilege of considerable value in the construction of the telephone plant.

The company has secured a large number of contracts for subscribers and has as its stockholders many of the leading local business men.

The construction is well underway for the initial exchange in the downtown district. The International Telephone Manufacturing Company, of Chicago, is making rapid progress on the telephones and switchboard equipment. The board is being built for an ultimate capacity of 12,000 subscribers, and will be installed with an immediate complete equipment for 1,000 exchange lines and necessary toll line apparatus for connecting the State toll line systems with a downtown business men's exchange. The system

will be a full central energy plant with lamp signal double supervisory multiple switchboard embodying all the "International" improvements.

It is the plan of the Co-Operative company to install the business men's exchange at the earliest date possible, to give the Independent exchanges throughout the state an entrance into the city and Detroit service, and then complete the entire plant.

The officers of the Co-Operative company are: Mr. C. M. Burton, president; Mr. Max J. L. Towler, vice-president; Mr. J. C. Danziger, secretary; Mr. J. Ward Howland, treasurer; Mr. Jasper C. Gates, attorney.

THE RURAL TELEPHONE.

Before the rural telephone came, the farmer loaded his product and hauled it to the city, often to find that the bottom had dropped out of prices. If the produce was perishable, he had almost to give it away, and the receipts hardly paid the wear and tear on the team and wagon. Now, the farmer who has a telephone can call up the city before he starts, and if the market isn't right, he postpones his trip until another day. If a physician is needed, the farmer with a telephone no longer has to ride for miles out in the midnight. The telephone is a life-saver as well as a money-saver. Extensions to smaller cities and towns were slow because investors believed they would receive the greatest return on their investments in the more populous places. The small towns learned of the telephone, however, and soon became eager for the service. Many of the rural companies are co-operative. The farmers erected the poles and strung the wires. The service on such lines is not always satisfactory for the reason that the equipment is not of the best and the systems are not kept in the best of order, but it is far better than nothing, and the men who are putting their money into the telephone business say that such telephones serve to educate the people and create a demand for better service. The day has come for rural telephones, and the farmer as well as the business man has found that the telephone is an imperative necessity.

A merchant who lives in a town of 1,000 population or more ought to have a telephone in his store. Storekeepers in the larger towns can telephone their town customers but the villages often have no local system, but are connected with some larger place, the one telephone in the town serving the entire telephoning population.

Comparatively few merchants, until the last few years, had telephone communication with their farmer customers, and even yet the great majority depend on rural and star mail routes and private carriers to reach their customers in the rural districts, says the Chicago Dry Goods Reporter. Local companies, formed to operate systems in small towns, cannot afford to build lines to the farmer and furnish him service at a price he is willing to pay.

But there is a practical method to get a telephone in every farmer's residence in your territory. Once this plan is under good headway the farmer shows his appreciation of it. He can telephone to town whenever he wants to; he can talk to his neighbors and relieve the monotony of living miles from anyone. The farm loses half its terrors when a telephone is installed. And the merchant can make it pay him well. Of course most of the profit is indirect, just as the profit from using printer's ink is indirect, but it's sure. The beauty of the telephone advertising is that you advertise "just as you talk," and you have the farmer's undivided attention.

Here's a story of an actual occurrence. The story gives the plan that can be worked by any merchant. We suppress names and places but the writer can give them to any inquirer.

Three years ago a doctor, a merchant and a farmer who were fast friends decided to run a private telephone line, connecting their three places of business. While the local telephone service had been unsatisfactory, the private line was not intended to take its place, but to act as a means of communication between the three and to allow people who lived near the farmer to telephone to town in cases of urgent necessity or in bad weather. There was no thought of the line extending to other points. In order to build along the country roads it was necessary to get a permit from the county commissioners. In order to build in town it was necessary to get a franchise from the village board. Both these things were easily accomplished. When the line was built the cost was not as great as was anticipated, but the three saw where is could be done at less expense if it was necessary to do it again. Twelve other farmers talked over this line and thought it would be a nice thing to have a telephone in their own homes, so the line was extended about twelve miles. This was the beginning of a great farmer's system. Up to this time each man built the line necessary to reach his farm. Of course the communication at first was not the best in the world. There were minor errors in construction and some of the first telephones purchased were not satisfactory, owing to ignorance in knowing what to buy. But experience taught them to buy high grade apparatus and their by-laws now specify telephones with laminated magnets manufactured by the Chicago Telephone Supply Company.

So many farmers wanted in this new system, which was dignified by the name of "hayseed" and "grape-vine" line, that it would have been unwieldly as a partnership affair, so a company was formed under the laws of the state and articles of incorporation were taken out admitting one hundred shareholders, it being the purpose of the organizers to have one telephone for every share. The average price of a mile of line, including poles, wire, equipment and labor, had been established and shares of stock had a par value of $25.00, which was the cost of a mile of line. The desire for telephones spread so rapidly that the capitalization was increased four times, until at present there are about seven hundred farm telephones in use, with new ones being added every day. The company is organized to furnish telephone service as near cost as possible, and not with the idea of making a profit. Each farmer who wants a telephone must take stock in the company. A share of stock is given him when he builds a mile of line. All these "main lines" belong to the company. The farmer is required to build any additional branch line necessary to reach his house, and that branch is his own property. He buys a telephone, which is his own property. Toll messages from non-subscribers cost ten cents, and each stockholder pays 25 cents per month to go toward keeping up line repairs, paying switchboard operators, etc. Each stockholder is required to keep the line he built in good repair. The merchant who hires his work done is out from $25.00 to $35.00 for a mile of line. If he builds two miles some farmer who was not quick enough to see the advantage of the system will be glad to take the second mile off his hands at a fair price.

Farmer's lines are of course "bridging" lines, with from five to fifteen telephones on a line. The switchboard in town cuts out the merchant so that his telephone bell does not ring unless there is a call for him. But he can stand at his telephone and talk to one farmer or to twenty or thirty at a time, as he wishes. The system is absolutely satisfactory to the farmer, and it should be a source of satisfaction to the merchant, if he uses it right.

In the system referred to above the merchant and doctor sold all these things at a small profit, making enough to pay for their entire equipment, and enough additional to pay for their telephone service for several years. Even if a merchant doesn't make a penny on the transaction, it is a paying investment. If your local service now costs you $1.00 per month, it amounts to $60 in five years. With the farm system as outlined above you own

$25.00 stock in the company, your telephone costs you perhaps $15.00 and your monthly service charge is 25 cents, amounting in five years to $55.00, and if at any time you should sell your store you can get back your original investment.

To make the service satisfactory, the bridging telephones used on the farmers' lines should be of the right kind. The talking circuit must be one that will reproduce a moderate tone of voice without the "talking back" that is common to many telephones. The transmitter should be made so that slight vibrations and outside noises are not picked up. The ringing circuit is very important and has been the hardest to get just right. Your magneto should be powerful enough to ring through twenty telephones on a thirty-mile line and the cores on the ringer movement should have enough winding to receive the slightest impulse of the magneto. We could state in electrical terms just the "resistance," "ohms," etc., necessary, but it would be unintelligible to the mind not versed in telephonic lore.

A telephone system, started on this "co-operative" plan, properly installed and equipped, will be the means of bringing the merchant into mouth to ear contact with his farmer customers every day, and if a merchant can derive no good result from such advantages, he might as weii go out of business. There is no use in waiting for some company to do these things for you. You can do it as well yourself.

The merchant who helped start this farmers' line had three telephones, the "hayseed," the local telephone and the one belonging to the Bell system. Soon after the farm line was started it absorbed the local system. At present the merchant has one telephone, the "hayseed," and he can use it over any of the three systems with less cost to himself than before. There are many little details to the plan which have been omitted in this account, so that the story is hardly started. If any merchant is interested the writer can explain the details and tell how difficulties were overcome. It's interesting to know how another company was forced to give free service to the farm system, how merchants who were not as quick as the originators to see the point were obliged to build lines for the company and pay "rent" without receiving stock, how even the long distance telephones are at the service of the merchant and farmer. If you commence talking telephones now, by Christmas you ought to be in communication with at least a hundred farmers. Getting them in such a company with you, with some of them as directors and officers, establishes a bond of union that is not easily broken.

TOLL RATES AND TOLL DIVISION.

By H. C. Winter.

(Concluded.)

Make the initial radius 5 miles, add 5+1 to the first to make the second radius; for the third radius add 5+2 to the second radius, etc., each radius thus being the preceding radius added to a number beginning with 5 and increasing by 1 arithmetically. Stated in another way the first radius must be five, to get the second add six to the first radius, to get the third add 7 to the second, the fourth will be the third plus 8, etc., and the series of radii will be 5, 11, 18, 26, 35, 45, 56, 68, 81 respectively. Twenty-five cents will take a message 26 miles, approximately 1 cent a mile; 50 cents will take a message 81 miles at the rate of 5/8 cent per mile, and an additional 5 cents will carry the message an additional 14 miles, whereas at the start 10 cents will pay for only five miles. But in telephony as in nearly all other lines of business the rule obtains that a few cents added to a price secures an article or service whose real value increases in far greater ratio than does the price. Consequently there is no violation of any business rule and particularly not of telephony in the diminishing of the rate per mile as the distance increases, for this is a well recognized principle among all telephone companies. The first criticism that the above rates will receive and apparently invite is that they are too high and especially that objection will be made to the rates with the first and second circles. To such objections the response is that an air line mile and a customary mile are practically not the same, by which I mean that in calculating distance we usually, nay always, mean the distance by wagon road or railroad which very rarely follow the air line. You will say that according to these rates you would have to charge 15 cents to Pumpkin Hollow, six miles distant, whereas your rate is 10 cents, but if you will draw your 5-mile circle from your center you will be surprised to find your circle will fall a mile beyond your town, because customarily Pumpkin Hollow is considered six miles distant, when in fact it is only four air line miles distant. Geographically Madison and Waupaca are less than 90 miles apart, yet I traveled some 200 miles to get here and this section of the state is fairly gridironed with railroads. In short you will be surprised at the length of these air line miles and it may be safely stated that an air line mile practically exceeds a customary mile from 15 to 20 per cent. So I think that upon careful investigation and comparison you will find a schedule of rates established from the basis above stated to be fair and reasonable. By making the initial radius six miles instead of five, 25 cents will carry a message 30 miles instead of 26 and 50 cents will carry it 90 miles compared with 81, but remembering the increased length of these air line miles, practically an actual increase, I give preference to the schedule with a 5-mile initial radius.

To very briefly remark concerning night rates, the theory of making rate for night messages one-half the day rate is, no doubt, that it is better that lines which would otherwise be idle be kept busy with half priced messages even if a portion of such night messages would have been sent at daytime and at full rate had there been no night rate. No doubt the much reduced night rate induces some business that otherwise would not come to the telephone company. It is questionable whether it is best to adopt night rates for all stations. To secure the night rate divide the day rate by two and if the result is not divisable by 5 add to it until it becomes so. No night rate should be less than 10 cents.

A recent innovation by the Bell company is the minute rate to the non-important stations. This radical departure by the hard pressed monopoly was made when Glidden held sway and reckless management prevailed, when that company seemed not to care a particle for expenses and had an army of solicitors in the field to keep the Bell company before the people. To unduly emphasize the long distance feature of the telephone business and to impress the public with the advantage possessed by the Bell company in this regard and to discourage further long distance independent competition were the reasons that induced the adoption of the minute cut rate rather than financial considerations. If the operator times the conversation with a clock whose minutes contain 60 seconds I doubt very seriously whether the minute rate is a paying proposition. If adopted at all it should be confined to messages between large centers.

I have assumed in this discussion of rates that there was no competition with the Bell company, taking it for granted of course that there was none among the Independents. The competition of the Bell company is really very limited, as from 60 to 70 of the Independent toll stations are not reached by Bell lines. In over 100 towns in the state there are exclusive Independent exchanges and in many others where there are both exchanges the Independent exchange is nearly always greatly preponderating and even if the Bell lines reach such places the exclusive or largely preponderating exchange connection that the Independent toll lines enjoy gives them a great advantage and practically there is no competition in such cases. Nor do

the Bell rates necessarily have to be met in these cases for the inevitable 10-cent messenger fee of the Bell company really becomes a part of the cost of the message and this fee can generally be avoided by the superior exchange *facilities* of the Independents. And as the public as a rule prefer to patronize the Independent company, other things being equal, the competition of the Bell company in the toll line business is not as formidable as at first appears; but where it must be directly met the rates above stated may occasionally require special adjustment.

The second part of the subject, the division of toll, although simpler of solution than determining the rate, is of far greater importance. The prevailing practice of toll division among nearly all companies is to keep what you take in, which, stated without veneer, is a direct application of the porcine rule, take whatever you can lay your hands on, and the other fellow is welcome to the rest, approximate minimum, so that our share will approach the maximum, seems to be our sole ambition. This gross iniquity of division, or lack of division, of toll is a most prolific source of friction among the Independents and puts a damper on legimate toll line construction enterprise.

As to division, the plan I would suggest for a just apportionment of the toll is as follows: Combination tolls should be divided among the various companies transmitting the message in accordance with the air line distance between the receiving and transmitting points of the company transmitting such message, and all exchanges except originating exchanges that necessarily handle such message to be figured as 5 miles of air line, and originating exchanges to receive 25 per cent and originating toll stations 15 per cent of the toll additionally.

As the toll is based on the air line distance the division should also be, for no premium ought to be placed on circuitous routes. The expression, receiving and transmitting "points," has been used instead of stations, as a company's lines do not terminate at stations, but often meet another company's lines midway between stations. Where the pole line belongs to one company the phrase "Exchanges that 'necessarily' handle" is used, so that where there are two circuits, a local and a through, the message must be sent over the through circuit if possible and local exchanges would be precluded from attempting to switch the message at every flag station exchange in order to obtain increased mileage rating. Neither should a premium be placed on running a second or through circuit into the switchboard of every exchange it happens to pass through, for this is something that should be especially discouraged, as it seriously impairs the service. It was at first introduced to give each transmitting exchange 3 cents per message, but I found numerous cases where the message passed through so many exchanges that the toll was more than equaled by the total of the 3 cent exchange fees, and as the average toll for a combination message is generally less than a cent a mile and will often be about 3/5 of a cent a mile, by figuring the exchange as 5 miles the switching fee will usually be about 3 cents. Originating exchanges are given 25 per cent and toll stations 15 per cent of the toll, as exchanges and toll agents generally receive a commission, and in addition the work of accommodating, collecting and responsibility for toll should be compensated, and occasionally a toll charge is uncollectable, and such loss must be borne entirely by the originating company.

It may be a digression of the subject to discuss a plan for the encouraging of the construction of copper circuits, though this is sufficiently pertinent to warrant a brief mention. The great disadvantage the Independents labor under is the lack of long distance copper trunk lines—now a blackguard expression because so much discussed with nothing done. This state is particularly poorly provided with such trunk lines and yet no practical plan has been brought forward to supply the deficiency. To organize a separate long distance company for constructing and operating the lines has been suggested and often discussed, but it certainly doesn't seem to take and we must fall back on the efforts of the individual companies. To encourage and promote the construction of copper circuits I would suggest that all copper circuits constructed in the future be considered as twice their length in the division of toll for a period of two years. Figuring a mile of ordinary toll line as two miles of line when it becomes copper may seem like doubling the portion of the toll of that company, but such is not the case. To illustrate: Take a message originating with an exchange company and going to a station 50 miles distant and passing over the lines of two toll companies, each carrying the message 25 air line miles over iron circuits. The toll would be $0.40, of which 25 per cent would go to the exchange company, leaving $0.30 to be divided equally between the two toll companies, each getting $0.15. Now if one of these companies put up a copper circuit and carried its message thereon its 25 miles of line would be considered as 50, and the iron line company's 25 miles would be remain as 25, and the former company would now receive 2/3 of the 30 per cent, or $0.20, and the latter would only get 1/3, or $0.10. By putting up copper the one company increases its share by 1/3 and the iron line company loses 1/3. This increase is the tribute which the antiquated, out-of-date, poorly equipped company pays to the modern, up-to-date, properly equipped, enterprising and progressive company; the tribute that iron pays to copper. It would not be necessary as a rule to construct new toll pole lines, as most of the present lines carrying iron wire could easily be adapted to an additional circuit, the latter to be used for long distance, the former for the local toll business. To receive the benefit of this increase the copper line should be used only for the through business and not for the local message, neither could such line have a phone at every flag toll station, but only at the more important points. Copper toll line construction in Wisconsin is to-day at a standstill, and something must be done to stimulate it. The lack of such lines is the crying need of the hour, and the man of the hour in the telephone business is he who will devise a plan for securing them.

A CORRECTION.

TELEPHONY, Chicago, Ill.

Gentlemen:—You will kindly make a correction in the next issue of your publication. In reporting my remarks before the railroad telegraph superintendents on the occasion of their convention in this city I am quoted on page 81 as stating that the Stromberg-Carlson Telephone Manufacturing Company has been turning out an average of 15,000 telephones per year. The correction is to the effect that we have been turning out an average of 15,000 telephones per month. Yours very truly, J. J. NATE.

THE HARVARD BOOKS.

Telephone men interested in the matter of protective devices for telephone apparatus should write to Mr. Fredric Green, 226 South Clinton street, Chicago, for the series of Harvard books on protection. Number 9 of this series has just been issued and will be sent free to any address in the world, provided this publication is mentioned when writing.

THE AUGUST "SOUND WAVES."

The August issue of "Sound Waves," a telephone publication, contains a great many timely articles of interest to telephone men. The journal is a monthly and is published by the Electrical Publishing Company, 75 West Jackson boulevard, Chicago. Sample copies will be sent free upon request. The subscription price of the paper is fifty cents.